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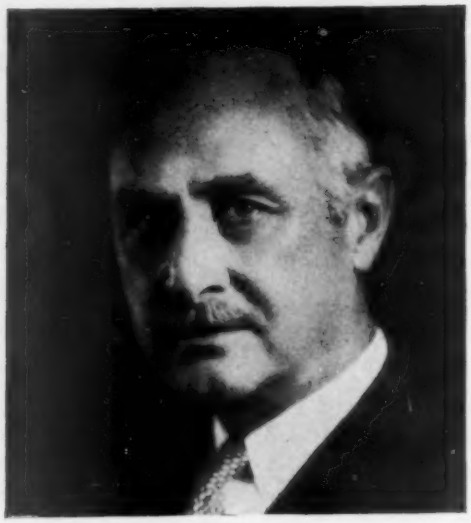
Essayists Who Participated in the Extraction Panel

Charles H. Tweed



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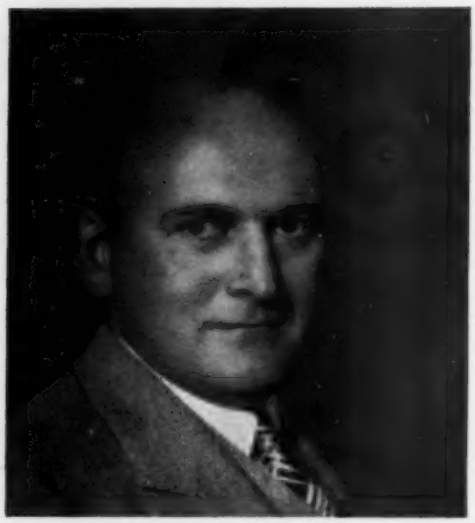
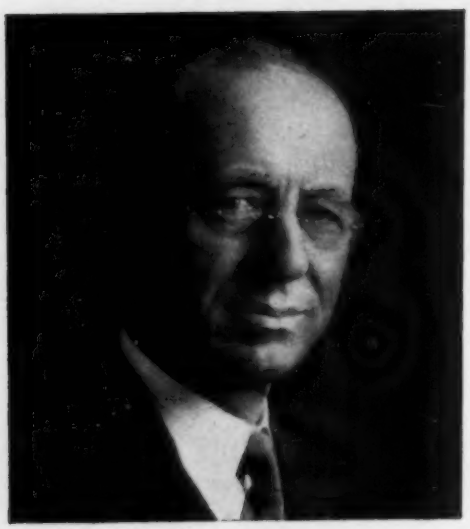


George W. Hahn

Moderator of the Extraction Panel held in Chicago during the meeting of the American Association of Orthodontists in April, 1944.



George W. Grieve

Allan G. Brodie

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Journal of Orthodontics
and Oral Surgery

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Extraction Panel

ORTHODONTICS: ITS OBJECTIVES, PAST AND PRESENT

GEORGE W. HAHN, D.D.S., F.A.C.D., BERKELEY, CALIF.

SINCE the first cumbersome attempt to move a single tooth into a more favorable position, the object of all orthodontic treatment has been, first, to improve the appearance of the human face, and second, to increase the efficiency of the dental apparatus as an organ of mastication.

Prior to the time of John Hunter (1728-1793), little was published regarding the reasons for the crude treatment of dental disease, but sufficient evidence has been accumulated to show that extraction was the method most frequently employed in correcting irregularities of the teeth. John Hunter was among the first to recognize the value of moving teeth as well as the principle upon which all tooth movement is predicated. In his work, *Natural History of the Teeth* (1771), we find the following paragraph: "To extract an irregular tooth would answer but little purpose if no alteration could be made in the situation of the rest; but we find that the very principle upon which teeth are made to grow irregularly is capable, if properly directed, of bringing them even again—this principle is the power which many parts (especially bones) have of moving out of the way of mechanical pressure."

In writing on the treatment of what we now recognize as Class II, Division 1 malocclusion, Hunter recommended the extraction of the upper first premolars and the expansion of the upper arch, and at the same time the closing of the spaces by carrying the anterior teeth back. In spite of his free use of extraction, Duval (1802) was the first to recognize that there was an ideal arrangement of the teeth and the need for its preservation. He states: "It is not sufficient that the teeth are properly arranged, by the side of each other; those of the upper jaw have a special connection with those of the lower, the least deviation from which diminishes the beauty of the appearance, frequently renders their functions laborious, and may often tend to their mutual destruction."

Talna, in 1854, laid down as one of the general rules of orthodontic procedure: "We must as much as possible preserve and improve, and only in

Read as part of the Extraction Panel at the meeting of the American Association of Orthodontists in Chicago, April 26, 1944.

extreme cases, mutilate." About 1865 Norman Kingsley wrote on the correction of irregularities of the teeth as follows: "I believe Nature to be the best model we can follow, and no one can doubt but it is her intention, and, as a general rule, most conclusive to the beauty of the individual, that all of the permanent teeth should stand on the arch. . . ." However, he was ready to recognize the value of extraction in certain types of malocclusion, for later he writes: "An erroneous teaching has maintained that the full number of teeth must be retained in the mouth, regardless of their organization,—the limited capacity of the arch, or the external features. The articulation of masticating organs is of much more importance than their number, and a limited number of grinding teeth fitting closely on occlusion will be of far greater benefit to the individual than a mouth full of teeth with the articulation disturbed."

John Nutting Farrar, who exerted a profound influence on orthodontic thinking during the last half of the nineteenth century, was one who felt that perfection in the occlusal relationship of teeth was not always productive of the best results. In discussing extraction, he makes the following statement: "To avoid deforming the face, while securing the best antagonism possible under the circumstances, is more desirable than to gain antagonism by the sacrifice of appearance. Let us try to increase usefulness by improving antagonism and mastication as far as possible, but let us not, in order to affect these, permit the faces of our patients to assume the appearance of apes."

In 1887 appeared a paper written by Isaac Davenport which was the most elaborate treatise on the theory of normal occlusion yet presented and which undoubtedly had an influence on the writings of Edward Angle. These two men between them are probably more responsible than are any others for the change in concept that influenced the treatment of malocclusion from about 1895 to 1940. To Angle, the human denture was inviolate; to his mechanical mind the removal of any one of the component parts from the mill was as deleterious in its effect as the removal of a tooth from a mechanical gear assembly. Perfection in occlusion was his ideal and he would tolerate no compromise. The theory of normal occlusion as advanced by Angle was such that the extraction of teeth in the correction of malocclusion was intolerable. Of all the men who have influenced the specialty, no one was as unsparing in his criticism of the extraction of teeth as was Angle. "That the best balance, the best harmony, the best proportions of the mouth in its relation to the other features requires that there shall be the full complement of teeth, and that each tooth shall be made to occupy its normal position—normal occlusion," he set up as a law which was based on the ideal of perfection in the human dentition in its relation to the architectural pattern of the individual, and did more to advance the standards of orthodontic procedure than any other single contribution. Indeed, his influence on the profession was so great that for years men struggled to adapt the full complement of teeth to the jaws with the hope as expressed by Angle, "that the normal stimulation caused by normal tooth relationship would develop the face and jaws to their ultimate perfection of balance and harmony." I pause for a moment in memory of the man whose uncompromising idealism even to the sacrifice of friendship itself has done more to make orthodontics a true science, combining the principles of physiology, mechanics, and art, than any other individual living or dead.

With few exceptions, the normal occlusion theory of Angle dominated the thinking, teaching, and practice of orthodontics in the early years of the present century. One of these exceptions was Calvin Case, who early recognized the large numbers of bimaxillary protrusion cases present in the white race. He laid down two rules relative to the extraction of teeth: first, "Never extract teeth for the purpose of making the operation of correction easier," and second, "Teeth should never be extracted in orthodontics except in cases of excessive protrusion producing decided facial deformities—and not even then, especially in young children, unless there is every indication of an inherent protrusion that will ultimately mar the beauty of the face for life."

This brief résumé of the last hundred and seventy years of orthodontic history shows that, with the exception of Angle and Davenport, the feeling of the leaders in the profession was that extraction, like amputation of any other part of the body, was not to be avoided if the exigencies of the individual case demanded it and no other method of correction was available.

The history of the question we are discussing today, that is, the place of extraction in orthodontic procedure, may be divided into three phases. That of the early practitioners, mostly dentists first, and orthodontists second, who extracted teeth more or less promiscuously to make easier the realignment of those remaining, primarily to improve the appearance, and with little thought to the function of occlusion or the effect of such procedure upon the development of the face and jaws.

With the advent of Angle and a few others, the pendulum swung to the other extreme: the inviolability of the denture as a functioning unit was the major premise; that the rearrangement of the teeth into their proper occlusal relationship would stimulate through normal function the normal growth of the lower part of the face became the accepted basis of orthodontic practice.

Within the last decade, certain men and groups of men recognized that only a small percentage of cases treated were being retained indefinitely in a normally functioning position. They maintained that the large proportion of failures was due to the anterior displacement of the teeth during treatment. As there is no known method of developing basal bone, these men felt that although the integrity of the denture is an ideal to be held, the welfare of the individual patient, both esthetically and functionally, demanded the sacrifice of dental units in the treatment of certain types of malocclusion. That this philosophy has caught the popular fancy there can be little doubt, but unfortunately many of those who have adopted it have neither the training nor the judgment to determine its possibilities or its limitations. Many have accepted it as a panacea for all orthodontic ills, little realizing that it is a form of compromise that must be resorted to only when the most careful analysis of the individual case has been made.

The excellent work of Brodie, Broadbent, and others has drawn our attention to the fact that each individual has an inherent growth potential. Of all the organs in the body the teeth are least subject to interference in reaching this potential. There seems little doubt but that the normal development of the other parts of the structure, including the jaws, may be interfered with or delayed, in which case can it not be presumed that we may have a lack of harmony between the component parts of the dental apparatus, and so

long as we have neither the knowledge nor the skill whereby we can stimulate the growth of bone in localized areas, in a predetermined direction, extraction of teeth may be indicated?

In considering the question of extraction in orthodontic treatment, the discussion has centered around the treatment of malocclusions in those patients beyond the mixed denture age. Are we not overlooking the possibility of preventing the necessity for extraction of premolar teeth by the earlier treatment of malocclusion? It has been demonstrated that by judicious extraction of carefully selected deciduous teeth and the application of a minimum of mechanical interference, the normal positioning of the six anterior teeth and the first premolars is in some cases assured. With this anchorage available and, if necessary, supplemented by occipital force, it is possible to move the permanent molars distally the slight amount sometimes necessary. Such foresighted treatment insures the preservation of the integrity of the denture and permits of the establishment of normal occlusion in its true sense. Are there not other avenues such as this that should be explored?

Theoretically there should be no excuse for compromise treatment. When we consider it, we admit failure. Naturally, this may be due to causes over which we have no control, but to offer it as a philosophy of treatment is to admit our own lack of understanding of the principles of growth and development, as well as of our skill and ability to manipulate the mechanical appliances now in use or to develop new methods of treatment that will permit us to maintain inviolate the architectural pattern of the human denture and its supporting structures. Extraction is only one form of compromise treatment of which there are many. The question is not limited to extraction per se, but to whether the condition existing in the supporting structures will tolerate the restoration to their normal positions of all of the teeth.

What then is the objective of modern orthodontics? This, I believe, has been well expressed in a paper published in 1936 by Robert W. Strang: "The mere alignment of teeth is no longer the all-inclusive ideal of advanced orthodontia. Neither is the correct meshing of the so-called inclined planes of the teeth of the two dentures the sole factor that should be considered in the final result. The objective points in orthodontic treatment of today may be tabulated as follows: the correct relationship of each individual tooth to its architectural position in the anatomy of the skull; the normal axial positioning and proximal contacting of each tooth; the proper denture form and inter-relationship; and, finally, the balancing of all environmental structures and forces that are a part of, or associated with, the organ of mastication whereby the results of treatment may be stabilized."

Our present concept of orthodontics was founded on idealism, and the attempt to maintain that ideal is responsible for whatever real progress has been made in the science. Have we arrived at the point where we can say that no further progress is possible, have we reached the goal in the treatment of malocclusion? If we assume that we have, the doors to further progress have been closed. Orthodontics today is faced with a dual responsibility: First, our responsibility to those who come to us for advice and treatment, and second, to so improve the teaching and practice of orthodontics that those who follow in our footsteps may profit from our experience.

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INDICATIONS FOR THE EXTRACTION OF TEETH IN ORTHODONTIC PROCEDURE

CHARLES H. TWEED, D.D.S., F.A.C.D., TUCSON, ARIZ.

I PRACTICE orthodontics in a community of 50,000 people. I freely admit having made about every mistake an orthodontist can make. My educational background is quite ordinary, and I have not had the advantage of any research connected with a university. What I say today and the conclusions I make are purely personal and objective. However, my opinions and conclusions are based not on hearsay, but on factual clinical evidence gathered during seventeen years in the practice of orthodontics.

Early in my professional career a good man and a great one thoroughly inculcated in my mind two thoughts that I shall never forget. One of these was that the greatest of all the senses is "horse sense." The other was, "If you are right and know you are right, let nothing change your mind nor alter your course." I have followed Edward H. Angle's advice for the past eleven years.

I practiced the philosophy of the full complement of teeth diligently for six and one-half years, and for eleven years I have practiced orthodontics otherwise. To those of you who have not had this experience I suggest an open mind, because one who has never tasted a persimmon cannot logically argue with one who has. At the end of six and a half years of orthodontic practice, during which time I lived and breathed the philosophy of the full complement of teeth, I called in 70 per cent of all the patients I had ever treated and classified the results into successes and failures. Models, x-rays, and photographs were made of all these patients. To my amazement, I found that my successes were less than 20 per cent and my failures more than 80 per cent. Those cases for whom all orthodontic objectives had been successfully attained were designated successes. Those cases for whom the orthodontic objectives had not been attained were designated failures. The orthodontic objectives that I strive to attain are as follows:

1. Stability of end result—teeth that remain in their corrected position.
2. Healthy investing tissues insuring longevity of denture.
3. A dental apparatus that can do its work efficiently.
4. The best in facial aesthetics.

My findings were a distinct shock to me, and I immediately visited my professional brothers. They, too, were amazed and were certain that they were doing much better. However, up to date, I have never found an orthodontist who can take me into his office and show records of the successful treatment of 20 per cent of his cases; few can show 10 per cent, or 5 per cent. I mean by this, they cannot produce the records to prove that in 20 per cent of their

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treated cases they have attained all orthodontic objectives and the patient has been free of all retaining devices for a period of two to five years. If this is true, and it seems to be, is orthodontics a profession or is it something else?

For as long as the philosophy of the full complement of teeth has been practiced, orthodontists have presumed they could create normal occlusion for any patient who came to them. They obviously have believed that when they attain good occlusal relationships for their patients, the stimulation of function will cause the base bones to grow forward and under protrusive dentures. It is also apparent they believe that upon the completion of growth following orthodontic treatment, normal occlusion will be attained and the best in facial aesthetics will be the reward for both patient and orthodontist. This assumption, as you all know, is a fallacy in an overwhelming percentage of our cases.

In the broad sense of the word, there are few individuals who are normal. Rare indeed, are those people who pass through the prenatal period and that period from birth to the twenty-first year without misadventure. The patients who come to us for treatment are not physically normal people. If they were, they would not have malocclusion. Many of them are perhaps no more than 75 per cent physically normal. The tooth pattern has been laid down early in life. We are told that after the third year nothing can affect the size of these teeth—the pattern is fixed. Recent scientific evidence shows that misadventures in health during the growth and development period do affect osseous growth, and that when something is lost in bone growth it is never regained at a future date. If this is true—and I think it is—then we must face the fact that there is a discrepancy between tooth pattern and base bone in the majority of cases that come to us for treatment. Furthermore, it is futile and foolish to even hope that normal occlusion can be attained for any patient when this discrepancy exists. I maintain that normal occlusion or perfect facial aesthetics can never be attained without the full complement of teeth. But I also maintain that when a discrepancy between tooth pattern and basal bone does exist, it is far better to remove dental units to bring about a balance between tooth anatomy and basal bone; and that if this correction is made, our patients will be benefited by a nearer approach to the normal than is possible if we retain all the dental units and in so doing are compelled to displace all the teeth off the dental ridge and into protrusion.

The philosophy of the full complement of teeth was justified until it was conclusively disproved by recent research findings. It has been less than fifteen years since B. Holly Broadbent gave to the profession the first true picture of the normal growth and development pattern of the child's face. We have that picture before us and we neglect to refer to it for guidance.

Allan G. Brodie in his research has clearly indicated that it is impossible to make basal bones grow. Schour, Massler, and Brodie have demonstrated where the jawbones grow, when they grow, and where and when they do not grow.

Margolis, using Broadbent's normals, has demonstrated that the normal angular variation of the mandibular incisors with relation to the lower border of the mandible is approximately 8 degrees—from 85 to 93, not from 85 to infinity.

As dental students we were all taught that the mechanics within the denture demanded that in all successful restorative work the teeth must be positioned upon the dental ridge. The same principles of mechanics are operative upon the human denture, and we as orthodontists must relearn what the general dentist has known for the past half-century. We must position the teeth on the dental base to satisfy the laws of sound mechanics which are the same laws that govern our orthodontic objectives.

To be brutally frank, many brilliant men have renounced good common "horse sense" and sound mechanical principles in favor of the philosophy of the full complement of teeth and have spent a lifetime in orthodontics, butting their heads against the impossible that has led to so many orthodontic failures and heartaches. Should we continue in their path? I am of the opinion that if we, as orthodontists, do not render a far better service to mankind in the future than we have in the past, orthodontics will cease to be a respected specialty in the professions.

To aid you in correctly interpreting the illustrations, a few words of explanation pertaining to the sectioned models are necessary.

The bases of all these models are cut parallel to the occlusal plane. Whenever the profile of the patient appears with the sectional model, note the positions and inclinations of the mandibular incisors with relation to dental base and correlate the positions of these teeth with facial aesthetics.

Fig. 1 illustrates four sectional models.

A, the top figure is a model of a nonorthodontic normal. Note the inclinations of the mandibular incisors as related to dental base—also note the thinness of the alveolar process and compare with *B*.

B is a sectional cast of a finished orthodontic case. Note the angular inclination of the mandibular incisors. The alveolar process is quite thin due to the fact that these teeth have been tipped off the dental base—not displaced bodily—compare with *A*.

C is a finished orthodontic case in which the teeth have been maintained in an upright position but have been bodily displaced mesially. Note the thickness of the alveolar process and compare with *A* to determine the extent of the bodily displacement.

D shows the retreatment of *B* after the removal of all four first premolars. Compare *D* with *A* which is the nonorthodontic normal. Note the similarity of the inclinations of the mandibular incisors with relation to dental base in *A* and *D*. Note, also, the thinness of the alveolar process in this treated case, *D*, and compare with the nonorthodontic normal in *A*.

It is my conviction that in the successful treatment of all malocclusion, the mandibular incisor teeth must be positioned on basal bone to be in functional mechanical balance, and that this position is the normal one for these teeth and the most accurate guide available to the orthodontist in the scientific treatment of malocclusions. This precept is based on what I consider to be the correct interpretation of the late Dr. Edward H. Angle's definition of "the line of occlusion."

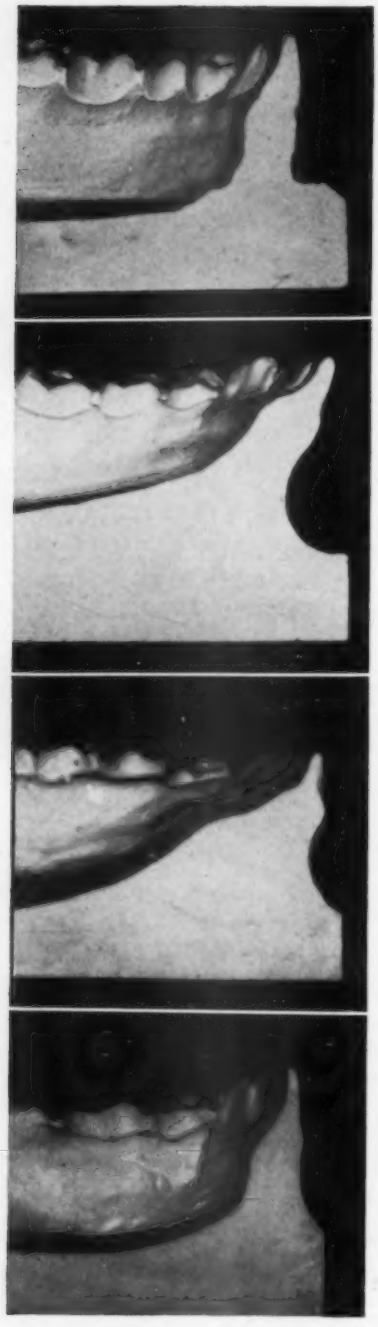


Fig. 1.

A study of this definition leads to the conclusion that there are six fundamental requirements which must be met if normal occlusion is to be the end result of orthodontic treatment. They are:

1. There must be a full complement of teeth, and each tooth must be made to occupy its normal position.
2. There must be normal cusp and occlusal relationships.
3. There must be normal axial inclinations of all the teeth.
4. There must be normal relationships of teeth to their respective jawbones.
5. There must be normal relationship of the jawbones to each other and to the skull.
6. Normal function of all the associated parts must be established.

In general, orthodontists are agreed that Dr. Angle was correct when he insisted that the line of occlusion is synonymous with harmony, balance, symmetry, beauty, art, and permanence of normal tooth position, and that in a permanently successful treatment it is impossible to attain one of these qualities without attaining all the others. I have always believed it to be true and I still do so believe. But it is now quite evident that in the beginning of my career as an orthodontist, this definition of the line of occlusion was to me a misty and vague phrase, the meaning of which one must learn to sense. In other words, I had no concept of the normal other than of correct occlusal relationships and ideal arch form. Too often, however, when only these two qualities were attained, something was lost in the balance, harmony, and beauty of the face, and in the permanence of tooth positions.

The most logical starting point from which to begin the search for the causes of my difficulties in the treatment of malocclusions seemed to be a thorough, unbiased analysis of my practice. Accordingly, I divided my cases into two groups: Group I, the successes; Group II, the failures.

In a surprisingly short time it became evident that the patients in Group I (Fig. 2) were much better-looking than those in Group II (Fig. 3). Group I showed balance, harmony, and beauty of the face in accordance with type; Group II did not.

Careful examination of the mouths and faces of the children in Group I revealed that all six of the fundamental requirements for normal occlusion were fulfilled (Fig. 4). Here before me were the living demonstrations of the line of occlusion, not the immaterial, intangible something which had to be sensed.

As a result of this experience I developed a concept of the normal, an indelible image of a face, the features of which formed a composite of the six qualities found in the mouths and faces of all the children in Group I (Fig. 5). A concept of the normal is an indispensable part of the orthodontist's equipment. Without it he does not know where or when to begin or end his treatment, but proceeds blindly, hoping that favorable growth factors and inanimate metals will come to his rescue.

Examination of the mouths and faces of the children in Group II showed that all fulfilled the first two requirements for normal occlusion; all had a full complement of teeth, and the objective of good cusp and occlusal relationships had been attained for all prior to relapse.

Fig. 2.—Group I. Correctly treated case.

Fig. 3.—Group II. Incorrectly treated case. Note the fullness of the lips which indicates an abnormal relation of teeth to basal bone.

Concerning the third requirement, it was observed that the mesial axial inclinations were too great in most instances. With respect to the fourth requirement, that of normal relationships of the teeth to their respective jawbones, failure was pronounced. In an overwhelming proportion of the group, the mandibular incisor teeth were found to be too far forward in relation to mandibular basal bone (Fig. 6). This defect varied from a slight mesial crown

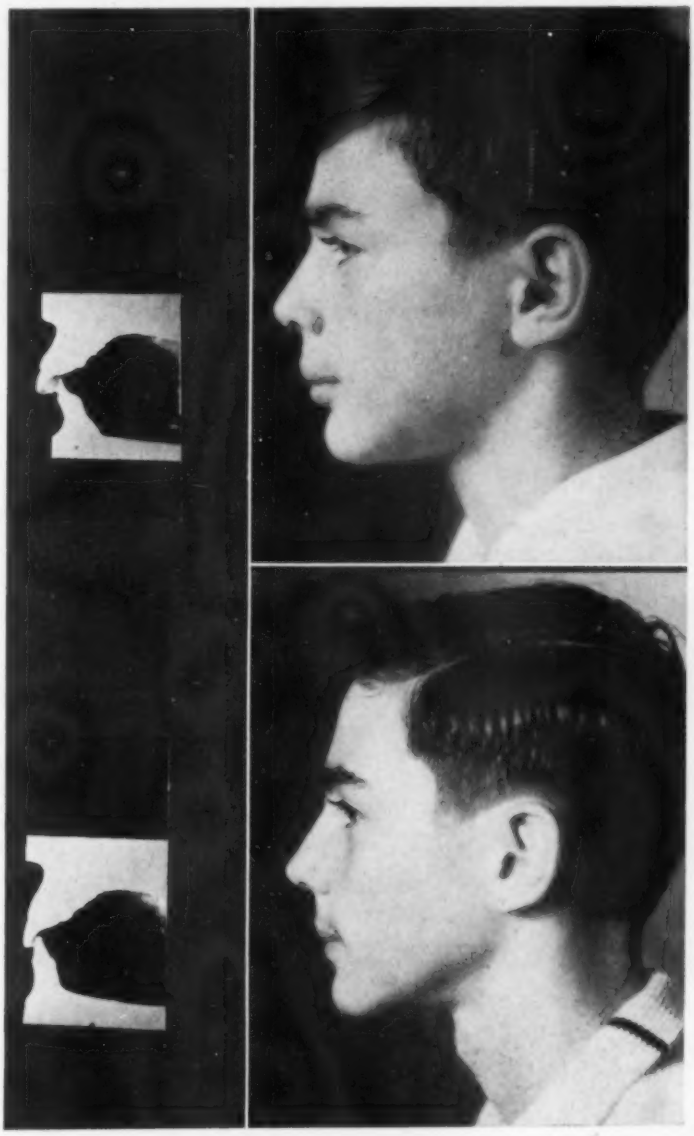


Fig. 4.—Group I. Correctly treated case in which all six of the fundamental requirements for normal occlusion were fulfilled. Note the inclinations of the mandibular incisors with relation to base, and correlate with the fine balance noted in the facial aesthetics seen in the lower figure.

tipping to severe displacement, and the havoc wrought in facial aesthetics was in direct ratio to the extent of the mesial tipping or displacement of the mandibular incisors (Fig. 7). Incidentally, facial aesthetics usually improved somewhat as relapse occurred in response to Nature's efforts to position the mandibular incisors back on the basal bone in functional balance.

As for the fifth requirement, that the jawbones should be in normal relation to each other, most of these children presented Class I malocclusion before orthodontic treatment was begun. According to Dr. Angle's views, the jawbones were in normal relation to each other. When treatment had been terminated, there was no doubt that they had been transferred from Class I malocclusion into bimaxillary protrusion (Figs. 6 and 7).

Fig. 5.—Correctly treated case demonstrating beautiful facial aesthetics as a result of correctly positioning the teeth in relation to their basal bones.

Children in this group, whose Class II malocclusion had been treated, presented mandibles that were still underdeveloped, though in most instances the cuspal relation had been successfully changed. This was accomplished by displacing the mandibular teeth mesially to a greater extent than the maxillary teeth had been moved distally. Thus, the result of the treatment was the exchange of a Class II malocclusion for one complicated by a bimaxillary protrusion. (Fig. 8.)

Obviously, not one of the children in Group II fulfilled the sixth requirement, that of normal function of all the associated parts.

Fig. 6.—The upper figure of the cast of the case before treatment demonstrates a normal relation of mandibular teeth to basal bone. Compare the inclinations of the mandibular incisors in the upper figure with those in the lower figure. Note how the mandibular incisors have been thrown into protrusion, and also note the effects on facial aesthetics.

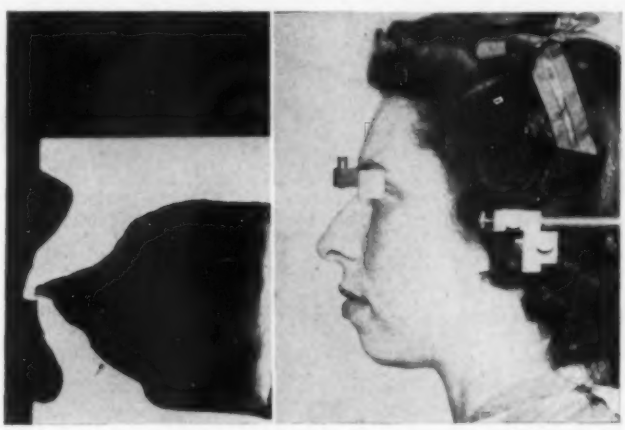


Fig. 7.—This case was incorrectly treated at the age of 13 years. Fourteen years later the stimulation of function had not corrected the protrusive condition, nor had facial aesthetics been improved.

This analysis of my practice clearly demonstrated to me that, as a rule, failures in treatment were caused by failure to correct all perverted axial inclinations and to establish normal relationships of the teeth to their respective basal bones.

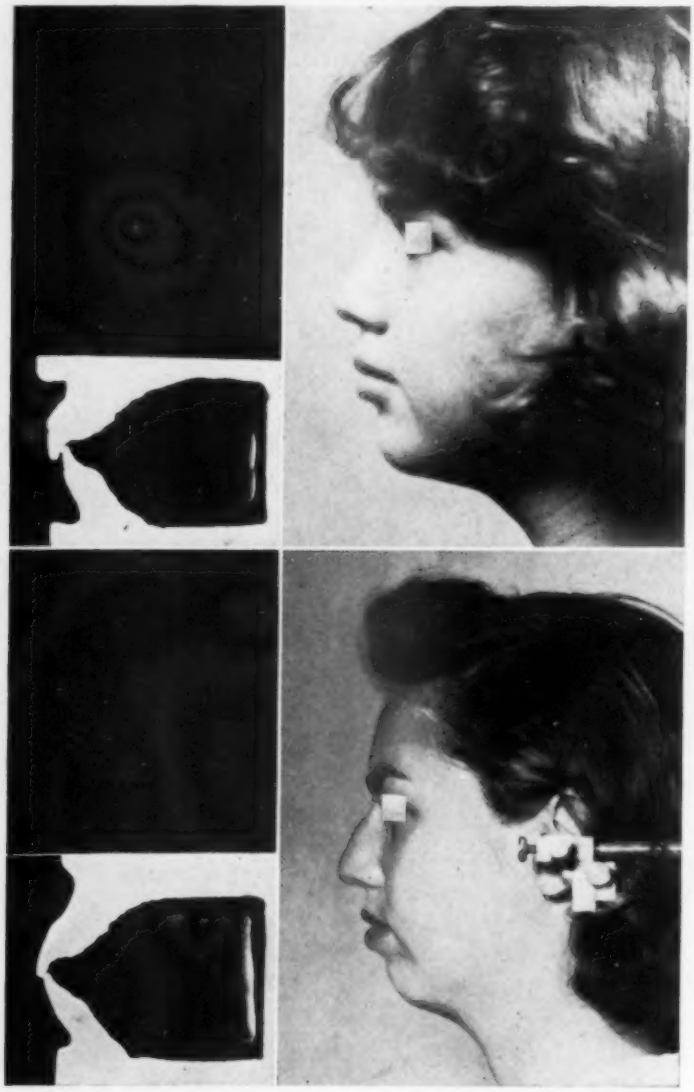


Fig. 8.—Improperly treated case. Compare the inclinations of the mandibular incisors and note that the inclinations are worse after treatment than before. Also, note that the stimulation of function for thirteen years has not been beneficial to either denture or facial aesthetics.

For years I have been on the lookout for faces that approached my mental concept of the normal. Whenever opportunity offered, I examined the mouths of those whose faces presented such characteristics. With few exceptions, all had either normal occlusion or Class I malocclusions. In all cases the mandibular incisors were on basal bone, even though in Class I cases they were irregular. It thus became evident to me that there is a definite correlation between balanced facial lines and the position of the mandibular incisors with relation to basal bone.

In order to become more familiar with the normal relation of the mandibular teeth, especially the incisors, to basal bone, I made a study of the mouths of individuals with normal occlusion. The growth and development of both the dentures and faces of these people had apparently followed normal growth patterns, since none of them had required orthodontic aid.

Accurate profile photographs were taken of my subjects, and plaster models made of their mouths. These models were then cut through the median line. A study of these cross sections through the body of the mandible and alveolar process at the median line demonstrated that in each instance the mandibular incisors overlay the basal ridge of bone, which is that portion of the body of the mandible on which the alveolar process rests. Further careful observation showed that this relationship was correlated with the fine balance and harmony of facial aesthetics virtually always found in such cases.

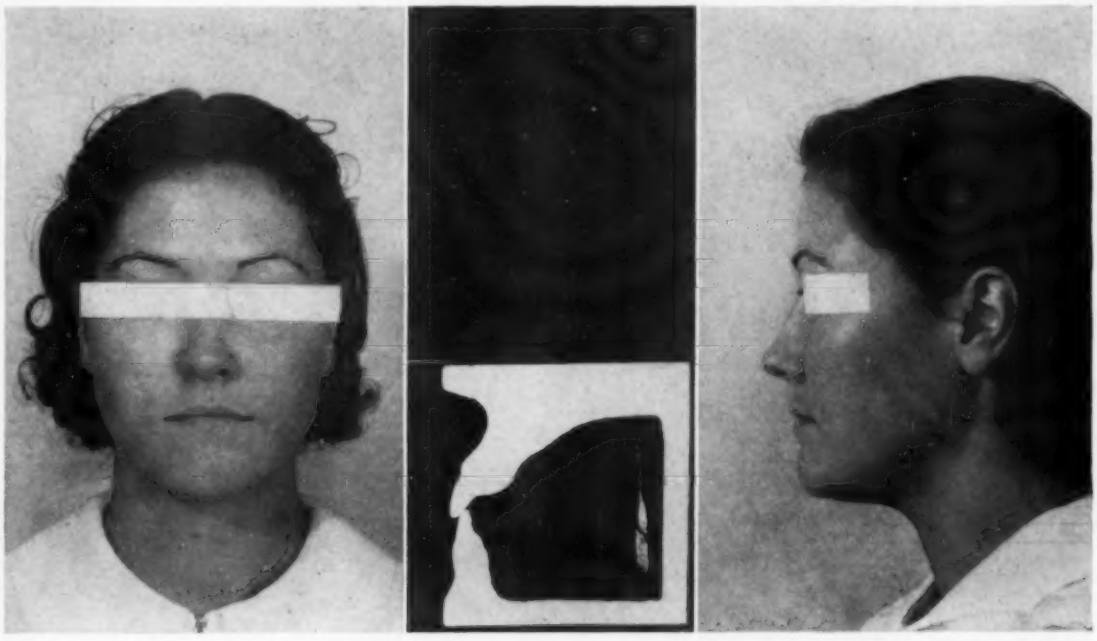


Fig. 9.—A normal occlusion demonstrating minus 5 lingual axial inclinations of the mandibular incisors.

These normal cases did present variations in the axial inclinations of the mandibular incisors. For descriptive purposes, the normal that demonstrated the greatest lingual axial inclinations of the mandibular incisors was designated as minus 5 (Fig. 9), the normal having the greatest labial axial inclination of these teeth as plus 5 (Fig. 10), the normal whose axial inclinations were nearly vertical as 0 (Fig. 11). A knowledge of this range of variability of the normal axial inclinations of the mandibular incisors is very important in treatment. (Fig. 12.)

It is only remotely possible that any orthodontist will ever be able to examine a patient and accurately predetermine where, in this scale of minus 5 to plus 5, the mandibular incisors must be positioned in order to be in functional and mechanical balance. Our endeavors in treatment must therefore be

Fig. 10.—A normal occlusion demonstrating plus 5 axial inclinations of the mandibular incisors.

Fig. 11.—A normal occlusion demonstrating 0 axial inclinations of the mandibular incisors.

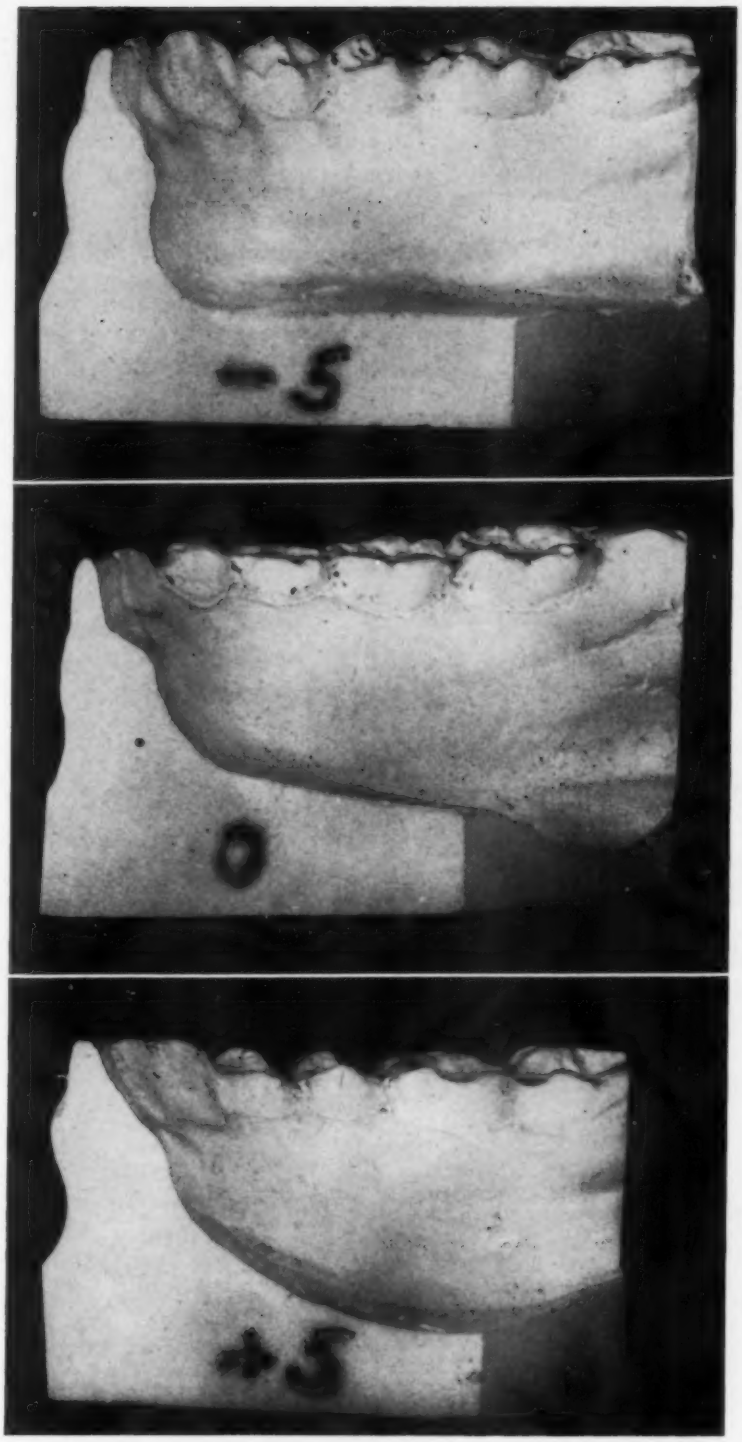


Fig. 12.—Minus 5 to plus 5 range of the normal axial inclinations of the mandibular incisors.

to place the mandibular incisors at minus 5 on the scale in order to safeguard against relapse (Fig. 13). Most of us agree that there is little likelihood of positioning the denture too far distally in relation to the basal bones, and that if we should err in this direction, function will drive the denture forward so that eventually it will find its functional balance point somewhere within the range of minus 5 to plus 5. Experience has proved that ordinarily it is impossible for function to make such a correction when treatment has left the denture in protrusion. In such cases we have all experienced collapse and failure in the lower incisal region as Nature endeavored to bring the denture back to functional mechanical balance.

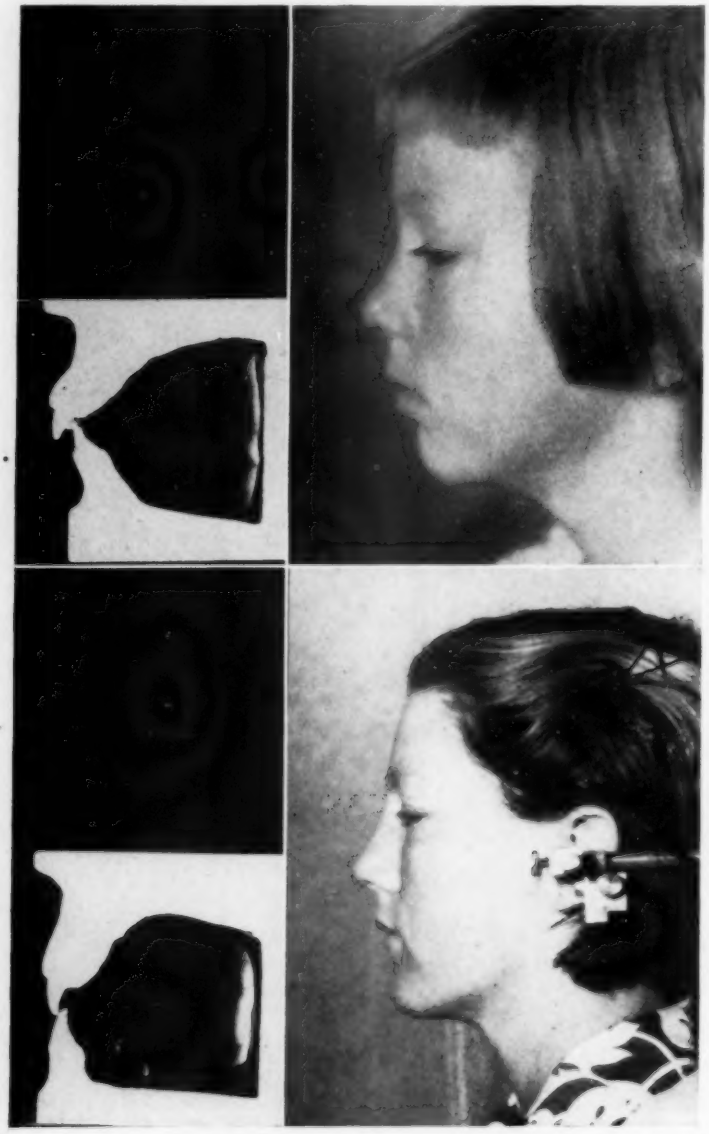


Fig. 13.—Minus 5 relation of mandibular incisors. This is not an extraction case. Note the difference in the inclinations of the incisors before and after treatment. Note also the thinness of the alveolar process in the lower figure which indicates that the mandibular incisors have not been displaced forward into protrusion. The conclusions are that the mandibular teeth have been moved distally.

The evidence gained from this practice analysis compels me to accept this relationship of the mandibular incisors to their basal bones as a guide in diagnosis and treatment, and I no longer depend entirely upon the positions of the cusps and upon occlusal relationships.

The causes of the majority of my failures in treatment are now readily understood. Formerly, along with most orthodontists, I accepted the positions of the mandibular teeth as a guide in occluding the maxillary teeth, regardless of the relation of the mandibular teeth to their bony bases, though this relation is in most cases as far from normal as the corresponding relation in the maxillary teeth.

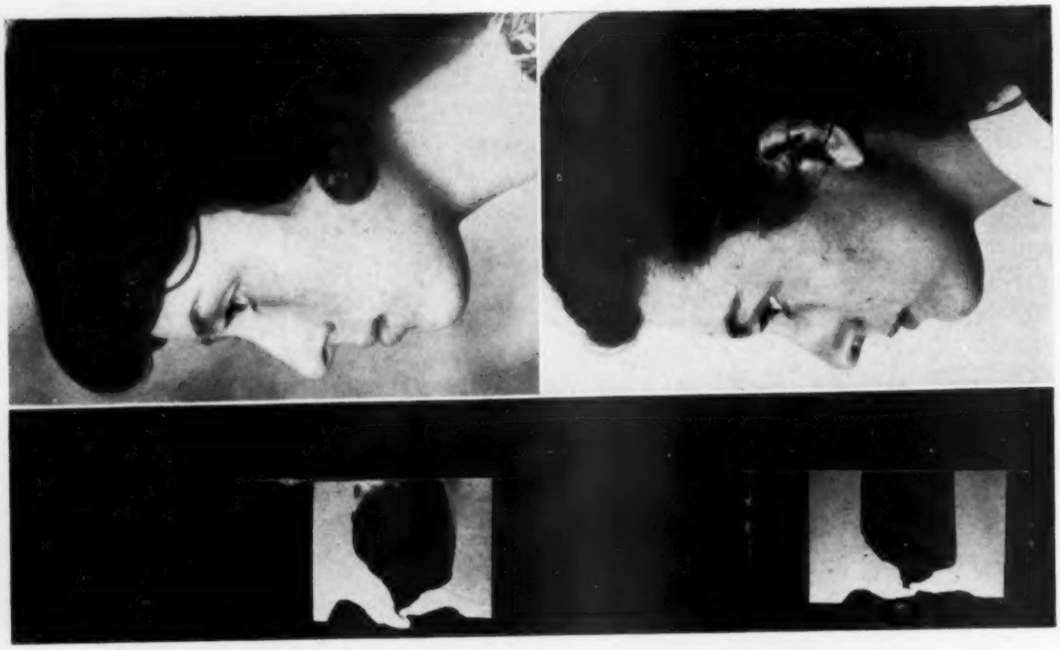
It is all too evident that we have refused to recognize the fact that mandibular teeth may have tipped or drifted mesially if there has been a break in the continuity of the mandibular arch, or if the restraining influence of the orbicularis oris is deficient. Also, if there is a lack of normal osseous development of basal bones, there is insufficient space to accommodate the teeth in their correct positions.

In the former case, it is at times possible to position teeth without removing dental units. In the latter case, owing to the discrepancy between tooth structure and osseous structure, we must resort to extraction of teeth if the best interest of the patient is served by securing harmonious facial lines and permanency of end result.

In the past, we have neglected to take note of this convincing evidence and have concentrated our efforts on correcting irregularities and rotations and gaining arch form. Without thought of first correcting the positions of the mandibular teeth, we have proceeded to use these malpositioned teeth for anchorage units. To facilitate the correction of irregularities and rotations, we have lengthened the arch wire and moved the lower anterior teeth farther mesially, exaggerating the already protrusive condition. We have then proceeded to articulate the maxillary teeth to the mandibular teeth. Thus, we have in reality only substituted one malocclusion for another, and the substitution has not always been an even exchange. In fact, I have come to the conclusion that in too many instances our treatment has retarded rather than stimulated growth and development processes, and that if favorable growth and development factors had not sometimes come to the rescue of both patient and orthodontist, the percentage of successfully treated cases would have been lower than it was.

There has never been a question in my mind during the past seven or eight years as to the correct position of the mandibular incisors, although I admit that the greatest difficulties are encountered in so positioning them. But in every instance where there is failure to do so, something is definitely lost in the balance and harmony of facial aesthetics, and I fail in my efforts to produce permanence of end results.

Further investigations were made to verify this theory. Similar bimaxillary protrusion cases were treated. In one group the full complement of teeth was retained and the cases were finished with the mandibular incisors either tipped or bodily displaced mesially from their normal positions. Facial aesthetics were bad, and the disharmony of facial lines increased in direct ratio to the



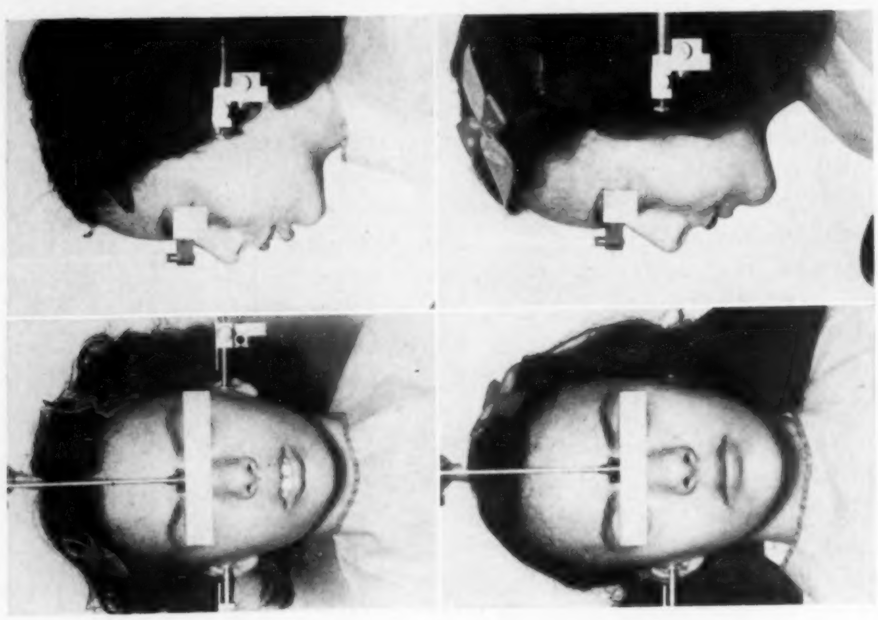


Fig. 14.—A discrepancy between tooth pattern and basal bone necessitated the removal of all four first premolars in this case in the name of facial aesthetics and permanency of tooth positions.

Fig. 15.—The extraction of all four first premolars and the correct positioning of the mandibular incisors was indicated in this case because of the discrepancy between tooth pattern and basal bone.

extent of the mesial displacement of the mandibular incisors from their normal positions. Years of retention were futile, and, as a rule, collapse of the mandibular arch in the incisal region occurred as Nature endeavored to correct this imbalance by positioning the denture back within the range of mechanical functional balance. Irreparable damage to hard and soft investing tissues, particularly in the incisal and first premolar areas, was the usual aftermath of such treatment. Almost the only exceptions to relapse were in those patients in whom the protrusive condition was so severe as to eliminate any restraining

Fig. 16.—This case was treated and the full complement of teeth retained with the results seen in the middle figure. Note the poor facial aesthetics. The case failed and two years later all four first premolars were removed and the case was retreated. Facial aesthetics are greatly improved and the denture is stable.

indicated in this case because of the discrepancy between tooth pattern and basal bone.

influence of the orbicularis oris, thus removing the possibility of natural recovery.

In another group, all four first premolars were extracted and the mandibular incisors correctly positioned with relation to basal bone. Facial aesthetics were greatly improved, and in some instances a near approach to the normal face, as I envisage it, was attained (Figs. 14 and 15). The average length of the retention period was one year. These dentures are functionally efficient and aesthetically pleasing, and the investing tissues are healthy. In addition, they are free from serious relapse.

Fig. 17.—The middle figure demonstrates the result of treatment without extraction. The case failed and was retreated with results seen in lower figure.

Fig. 18.—The upper figure is of the patient before treatment was started. The middle figure demonstrates the results of eight months' treatment. The mandibular incisors appear to be within the range of the normal but facial aesthetics were little improved. In the name of facial aesthetics all four first premolars were removed and the mandibular incisors were severely retruded, as demonstrated in the models in the lower figure. This seemingly abnormal inclination of the mandibular incisors was necessary to bring about the change in facial aesthetics noted in the lower figure.

A third group of patients was treated, and their dentures were left in bimaxillary protrusion. Facial aesthetics were deplorable and the cases relapsed when the wearing of retaining devices was discontinued. These same patients were then retreated after the removal of all four first premolars. The mandibular incisors were positioned on basal bone. The change in facial aesthetics was remarkable, and these cases are now out of retention and free from any serious relapse. (Figs. 16, 17, and 18.)

Fig. 19.

From this mass of clinical evidence, I have come to the following conclusions:

1. The attainment of normal occlusion as a result of orthodontic therapy is limited—much more limited than most of us now realize. (Fig. 19.)

2. In normal occlusion the mandibular incisors are positioned upright on mandibular basal bone (Figs. 9, 10, and 11). In the discussion that is to follow this presentation, I will, if allowed five minutes' time to do so, demonstrate to everyone present that the normal growth studies of both Dr. Allan G. Brodie and Dr. B. Holly Broadbent prove this statement to be true.*

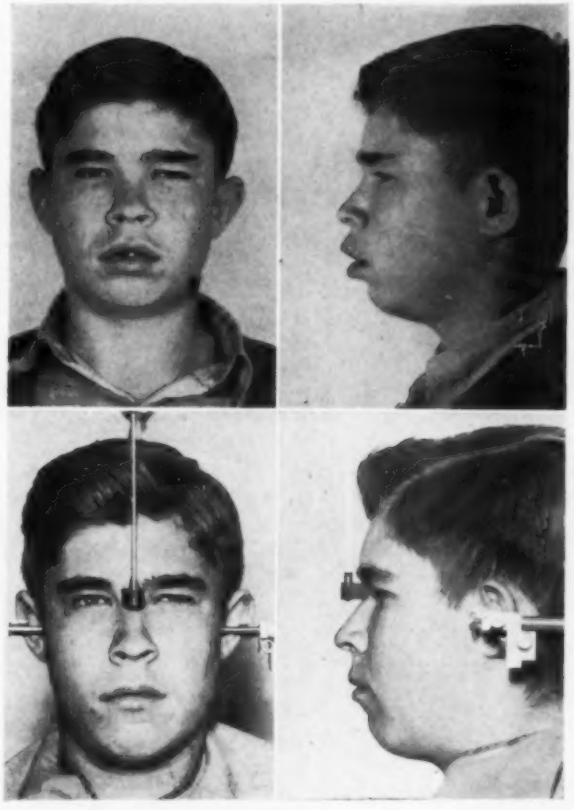


Fig. 20.—Owing to lack of growth in the body of the mandible, there is not enough room to position all the teeth correctly on basal structures. Four premolars were removed and facial aesthetics were improved. Four premolars, however, were not enough, but to date I have never had the courage to move a cuspid up against a first molar. If that were done in this case, it most certainly would further improve this lad's facial aesthetics.

*For years I have contended that in normal occlusion the mandibular incisors are always positioned in an upright position on mandibular basal bone; that normals do present a variation in the axial inclination of the mandibular incisors but that this variation falls within the minus 5 to plus 5 range—0 being vertical and upright.

To the best of my knowledge, Dr. H. Margolis was the first to relate the mandibular incisors to the mandibular plane to create what he has termed the "incisor mandibular plane angle." He further found that in most white children with normal dentitions and non-prognathous faces the mandibular incisors were at right angles to the mandibular plane and therefore the incisor mandibular plane was 90 degrees and the variation was less than 5 degrees either way in over 90 per cent of the 300 children examined. Any variation from the right angle in this type face being toward the minus.

In the August, 1940, issue of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY, there appears an article by Allan G. Brodie, titled "Some Recent Observations on the Growth of the Face and Their Implications to the Orthodontist." The basis of this report was the records of twenty-one normal children who were selected at random on the basis of excellence of roentgenograms; eleven in the 3 month to 7 year range and ten in the 6 month to 8 year range. Each series was composed of fourteen sets of head plates taken quarterly during the first year of life, semi-annually from 1 to 5 years, and annually from then on. All were males. On page 750, Fig. 8, the growth patterns of these children are shown. In nine of these cases in that series only the crowns were traced and not the roots, so the incisor mandibular plane angles could not be measured. In the other eleven instances the incisor mandibular plane angles are as follows:

In one case the angle is 92 degrees.
In six cases the angle is 90 degrees
In one case the angle is 84 degrees
In one case the angle is 87 degrees
In one case the angle is 85 degrees
In one case the angle is 83.5 degrees

(*Footnote continued on page 427.*)

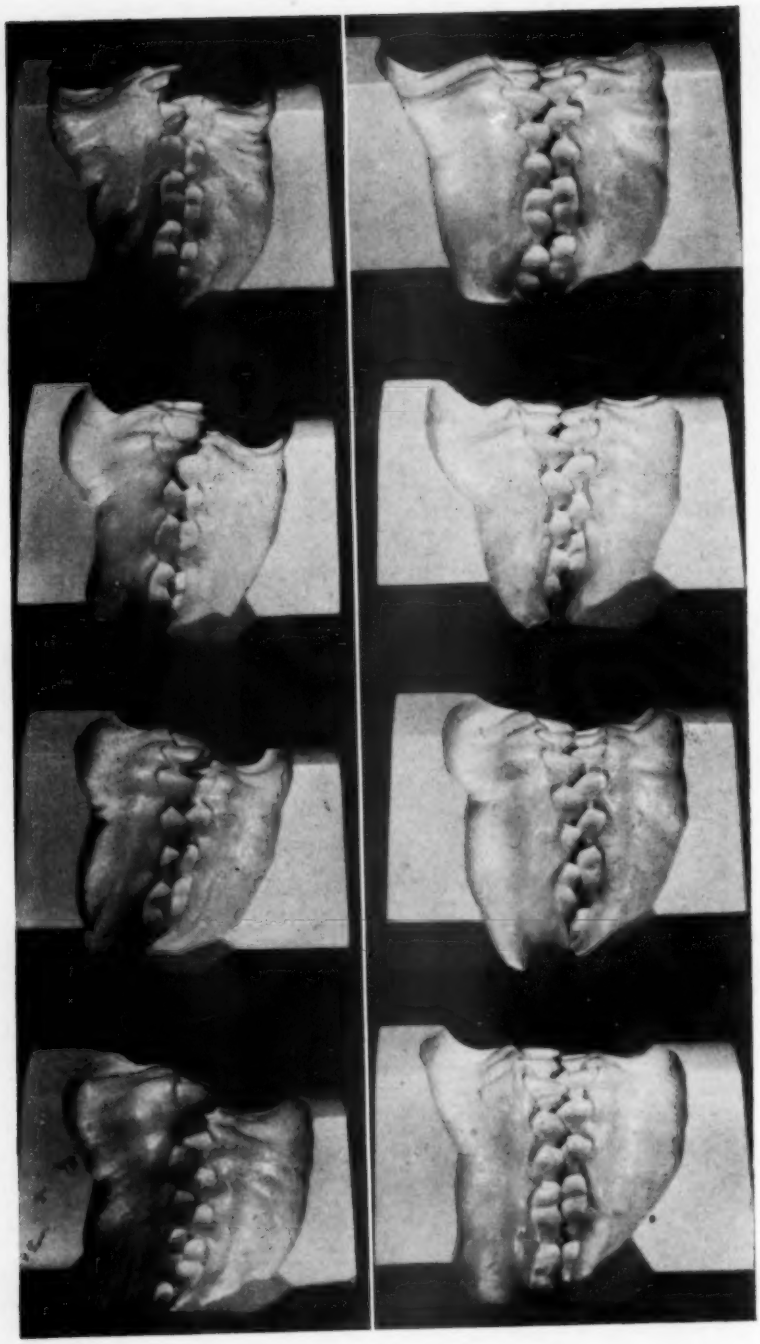


Fig. 21.

3. The ultimate in balance and harmony of facial aesthetics is achieved only when the mandibular incisors are so positioned (Figs. 4, 5, 13, 15, and 19).

4. Virtually all malocclusions are characterized by a forward drift of the teeth in relation to their basal bones. Owing to lack of growth in the body of the mandible anterior to the rami, there is often a discrepancy between tooth anatomy and osseous basal structure which makes it impossible for all the teeth anterior to the first molars to assume normal positions on basal bone (Fig. 20).

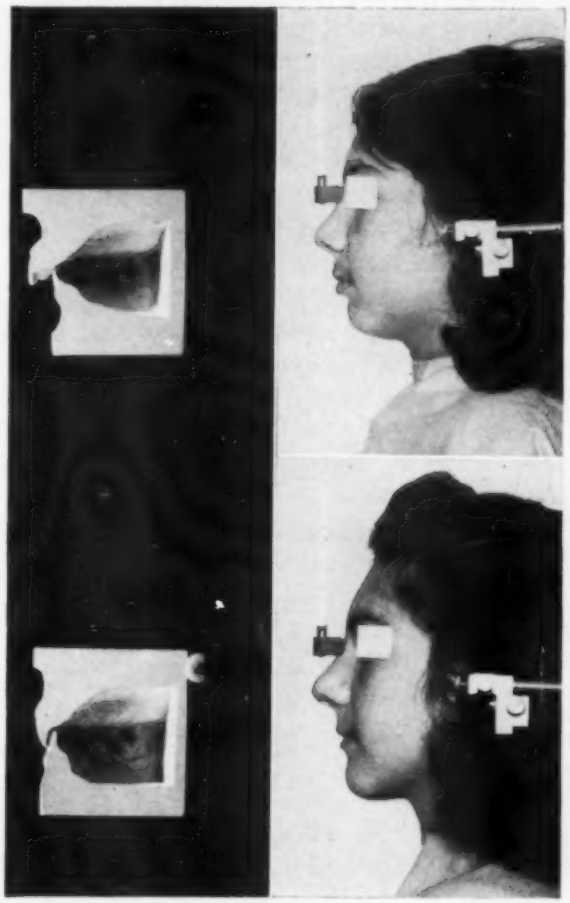


Fig. 22.

(Footnote continued from page 425.)

The angular variation of the mandibular incisors with relation to the lower border of the mandible is 8.5 degrees in this group of normals.

The average for these eleven cases is an incisor mandibular plane angle of 88.3 degrees, which is vertical or upright and well within the range of minus 5 to plus 5. In fact, it is minus 1.8 degrees.

In the *Angle Orthodontist*, October, 1941, page 239, Fig. 11, in B. Holly Broadbent's paper, titled Ontogenic Development of Occlusion," there appears a chart of the study of normal dentofacial developmental growth from the Bolton Study records of 3,500 white Cleveland children. The chart reveals the following facts:

1. The composite representing the children in the 3½ year bracket shows the incisor mandibular plane angle to be 90 degrees.
2. The composite representing the children in the 7 year bracket shows the incisor mandibular plane angle to be 81 degrees.
3. The composite representing the children in the 14 year bracket (the ones we are most interested in) shows the incisor mandibular plane angle to be 87.5 degrees.
4. The composite representing the adults shows the incisor mandibular plane angle to be 91.5 degrees.

The average for these 3,500 cases is an incisor mandibular plane angle of 87.9 degrees, which is within 8/10 of one degree of the average for the normals reported by Brodie. Again, an incisor mandibular plane angle of 87.9 is upright and nearly vertical; being so, it is obvious that in normal occlusion the mandibular incisors are upright on mandibular basal bone.

Such a discrepancy may occur even when the first permanent molars are normally positioned with relation to basal bone.

5. In the successful treatment of malocclusion, the mandibular incisors must be positioned in a normal relation to their basal bones (Fig. 21). So positioned, they are in mechanical balance, and best resist the forces of occlusion that will otherwise surely result in their displacement.

6. The normal relationships of the mandibular incisor teeth to their basal bone is the most reliable guide in the diagnosis and treatment of all Class I, Class II, and bimaxillary protrusion types of malocclusion, and to the attainment of the objective of balance and harmony of facial lines and permanence of tooth positions. Such positioning of the teeth often requires the removal of dental units. (Figs. 4, 9, 10, 11, 13, 15, 19, and 22.)

7. By removing all four first premolars in the treatment of bimaxillary protrusion, it is possible to achieve five of the six requirements for normal occlusion (Figs. 14, 15, 16, 17, 18, and 22). If they are retained, the possibility of ever achieving more than two of the six requirements is lost.

8. If the objectives of orthodontic therapy are (1) permanence of tooth positioning or stability, (2) healthy investing tissues that will assure longevity of denture, (3) a mechanically efficient masticating apparatus, and (4) the best in facial aesthetics, then it is my opinion that it is necessary to remove dental units in all those cases where there exists a discrepancy between tooth structure and basal bone.

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FUNDAMENTAL PRINCIPLES AND EXPEDIENT COMPROMISES IN ORTHODONTIC PROCEDURES

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PRINCIPLES and compromises used as comparative standards indicate opposite trends in mental attitudes. Principles thus have reference to tenets or doctrines, basic and permanent; and compromises, to settlement of controversies by surrendering principles. Fundamentals and expedients are just barriers limiting the trends to narrower confinements. Accordingly, "fundamental principles and expedient compromises in orthodontic procedure" may suggest an attempt to deal with moral issues. This, of course, is what I am not going to do. The reason I am mentioning these things is because there is so much philosophic dust raised about orthodontic aims and technical procedures as to obscure the nature of the goal and blur the source of its origin.

Just now, I am interested more in the destiny of orthodontics than in the moral trends or technical creeds of orthodontists. Despite the fact that the unsteady stream of life today makes the course of tomorrow so unpredictable, I believe that orthodontic practice and ethical standards must always be complementary. Similarly, I hold that basic concept and objective aim must be complementary too, despite the disturbing effect of the ever-increasing technical panaceas for the insufficiently known orthodontic evils.

The history of ebb and flow in conflicting ideas between "theory and practice" in orthodontics lends support to the belief that the more we seem to advance, the further back we go. This is probably due to the fact that appraisals of progress are often made by spurious standards. Extracting teeth for orthodontic purposes is a perennial example of it. Resorting to extractions inadvertently puts us back just where orthodontic history begins and contradicts the basic concept by compromising the aim. The "philosophies" used to fill in the vacuous gaps between concept and aim are, at best, just rampant rationalizations aimed at reconciling irreconcilable things. It may be that some of us have become "hard-boiled" by age and experience, but it cannot be denied that others have become softened up and insensible to "what's cookin'" by the long-continued pounding of sophistries upon the heads of those who are in the habit of sticking their necks out.

As a specialty in the department of health service, orthodontics, in my estimation, shares in common the foundation of science and art. Both in science and in art, existence, continuity, and progress would not be possible without systematic and orderly beginnings. *Fundamental principles* therefore are indispensable, because without them there can be no basic concept and no objective aim. Principles, of course, must be sound and trustworthy to be of significance. They become of fundamental importance when derived from tested,

Read as part of the Extraction Panel at the meeting of the American Association of Orthodontists in Chicago, April 26, 1944.

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proved, verified, and acknowledged facts which are basic in themselves. When recognized, approved, and endorsed, fundamental principles become the axis upon which the sphere of all related thinking and acting revolves.

In general, it should be understood that the axis of the orthodontic sphere is made up basically of teeth. It should, however, be remembered that orthodontics is concerned more intimately with multiplicity of teeth, with forms of teeth, with position of teeth, and with occlusion of teeth. This is fundamental because tooth number, form, position, and occlusion, in their application to the continuity of life on earth, are very significant features. According to the best available knowledge, they took part in such important biologic events as made the rise of many living creatures possible.[1] Even the coming of man is part of it.[2] Facts of this sort are important because they are fundamental. What makes them fundamental is the support gained from the unimpeachable evidence derived from such basic sciences as palaeontology, comparative anatomy, and embryology. Fundamental features of this kind are of significance to orthodontics because, in the evolution from the peglike denticles in the earliest vertebrates to the complex forms attained by the teeth in man, occlusion never ceased to be a concomitant factor.[3] These facts are also of special significance in orthodontics as they shed light on such differences in dentition as distinguish many groups among mammals and various races in man.[10] Thus, outstanding differences among mammals are found in (1) dental formula or number, (2) position of teeth, (3) their alignment into arch form, and (4) their adaptation to function. The changes which brought such differences about, whether they occurred simultaneously or in sequence, need not bother us now. The fact of significance is that they contributed substantially to the completion of the dentition of man as we know it today.[4]

Knowledge of this sort should be very impressive to orthodontists. It furnishes the most important biologic explanation of the responsibility for both the anatomic integrity of the dentition and the functional significance of occlusion. Consequently, the justification of orthodontics and the obligation of the orthodontist is to preserve the dentition and occlusion as they came to us from the dim past. We should at least be able to hold onto them for the present; if possible, for the future, too.

Edward H. Angle, who *made* the specialty of orthodontics, was not a scientist, but he had a remarkable scientific hunch. He had the good fortune to examine some skulls with exceptionally fine dentitions. He noticed that the teeth in those skulls were evenly aligned and well preserved. He also noticed that, on bringing the opposing jaws together, the teeth came into contact in what scientists used to call "mechanical relation of the upper and lower teeth."[5] The specimens in question being of adult human beings, he was careful to note that the number of teeth in each dentition was thirty-two. Angle was profoundly impressed by a dental equipment of that sort and decided to use it as a model for efficiency, superiority, or perfection. A dentition of this kind, he was convinced, would best serve as an ideal in orthodontic practice. It would furnish the basic point to start from and the objective goal to aim at. To simplify the idea, he substituted the term "occlusion" for "mechanical relation" and used the word "normal" to indicate the superlative or ideal. Angle thus recognized, and wanted others to recognize too, that "normal occlusion" is of fundamental

significance because it implies those requirements which are essential for functional efficiency. He was also convinced by previous experience that "normal occlusion" is attainable in all cases of malocclusion.

Angle was plagued then, just as some of us are now, by the all too frequent extractions of teeth for "regulating" purposes. Obviously abhorring this, he opposed it with all his might. In order to avoid misunderstanding, Angle first succeeded in proving that "normal occlusion" can be achieved *without* the extraction of teeth, and then formulated what he thought was a basic concept. The idea was to put orthodontics on a solid foundation and at the same time point out the fallacy of extractions. With his usual regard for system and order, he clad it with the authoritative mantle of "law." The "law," as he proclaims it, is that: "The best balance, the best harmony, the best proportions of the mouth in its relations to the other features require that there shall be *the full complement of teeth and that each tooth shall be made to occupy its normal position—normal occlusion.*"[6] Though the intention of this "law" was to put a taboo on the traditional evil of extraction, it was not very effective. But in framing it, Angle contributed to orthodontics a basic concept and a scientific aim, thereby issuing a challenge to orthodontists to solve a profound problem. This is the task which we are still grappling with.

The chief problem in orthodontics, as conceived and proposed by Angle and accepted by his followers who tried to solve it, is primarily concerned with: (1) the number and position of teeth and their occlusion; (2) the relationship of teeth to each other and their share in making up the form of the dental arches; (3) the effect of dental arch form upon the size and shape of the jawbones; and (4) the effect of the size and shape of the jawbones upon the aesthetic appearance of the face.

For the purpose of solving the problem in orthodontics, Angle first sorted out the varieties of occlusion as found in dentitions deviating from the "normal." He systematically separated them into three classes and devised appropriate technical means for gaining orthodontic ends in accordance with his basic concept of the problem as a whole. The guiding rules in practice were thus to be aimed at availability of proper equipment for services required in the restoration of "normal occlusion." To that end, the mechanical devices had to comply with exacting demands. They thus had to be "efficient," "simple," "delicate," and "inconspicuous." Progress from that point on was rapid and spectacular. Unfortunately, all of these rules in practice did not serve to guide us very long. Angle himself, by inventing the "pin and tube appliances" in 1911, retained just the first of his four technical demands and sacrificed the rest of them.

Like most of us, Angle, too, was a realist. He knew at the very outset that, to convince professional men, one is obliged to produce results. He did. He proved conclusively that, by the use of his original devices, it was possible to comply with his basic concept and achieve the objectives aimed at. This was highly significant. It had hitherto been thought impossible to retain the full complement of teeth, restore all of them to their proper position, and establish normal occlusion. The success in achieving this aim is what *made* orthodontics a specialty and what made it possible for us to discuss today those things in orthodontics we are not so sure about.

The trouble was that Angle stopped a little short. While he proved to the satisfaction of everyone that what he believed possible he actually accomplished, he did not go beyond that. It was later on when those who followed him began to get into trouble. Though grasping fully the significance of normal occlusion and treating all forms of malocclusion successfully, there was some difficulty in holding on to the successes achieved. The occurrence of collapses after treatment was as unexpected as it was puzzling. Angle had not explained the possibility of it before. Besides mentioning that "retention" is for the purpose of "overcoming the tendency of the teeth to go back to previous positions," he did not explain the likelihood of failure or that of relapse. After the shock of my first experience, I casually asked Angle what became of the case shown in Figs. 501 to 508, on pages 494 to 498, of his book.[6] He said, "It went back." It was conciliatory, but not reassuring. The resemblance between this and my own case was too close for comfort.

As it strikes me now, the problem of "retention" itself was little understood then and I doubt whether it is better known today. At any rate, the technique of making sure of good results was inadequate and the consequence was that the result obtained never looked as well at the end of the "six months' retention period" as it did before the retaining devices were first put on. All felt guilty about it and blamed themselves for probable errors, faulty or careless technique, or insufficient skill. No one dared speak about orthodontic results in those days unless they were orthodontic successes. Retreating cases then was the usual order of the day.

It was not until 1935, at a meeting of the New York Society of Orthodontists, that orthodontic misadventures were openly and frankly discussed.[7] Since then, a great deal has been said and done, but, as it appears, not much has been learned. The concept of failures, unlike that of fundamental principles, was then, as it appears even today, obscure and confusing. Of course, my intention was *not* to discuss failures. But they just cannot be ignored. If it were not for failures, I am sure the topic for the panel discussion of today would not be on the agenda. But the particular reason I am mentioning failures is that people have such peculiar notions about them. For instance, according to, shall I say, the philosophy of Dr. Tweed, relapses (such as the crowding out from perfect alignment of one lower incisor tooth) constitute failures and the blame is invariably put on "bimaxillary protrusion." This, of course, may be a convenient way of explaining the need for compromises, but it really explains neither the condition nor the cause nor the cure. However, since "bimaxillary protrusion" is correctable by extracting teeth and since to omit extracting teeth means failure, then the compromise indicated is inevitable. By putting into execution an attractive procedure with enough popular "appeal" to carry conviction, a panacea is at once available that will cure all orthodontic evils.

Now the meaning of what is talked about as "bimaxillary protrusion," in so far as I know, has not yet been explained. How it is determined is equally "a military secret." All that is known about it is either from the a posteriori inference that crowded lower incisors are due to "bimaxillary protrusion" or from the remedy prescribed for it. Namely, to correct "bimaxillary protrusion," it is held that the lower incisors are to mount to the top of the "ridge" over the "basal bone." Then all the other teeth are to retreat in order, according to plan.

But, four teeth must be extracted first, and *I do not mean the third molars.* Judging from the general enthusiasm and fanatic zeal with which this is put into practice, the assumed assurance is that failures and relapses in orthodontics are banned for all time. If ever there was a *panacea,* here it is. Take it or leave it.

I wish to emphasize that I have no quarrel with Dr. Tweed. I even admire his courage when he ventures to demonstrate so much wisdom with the support of so little exact knowledge. What puzzles me is the vociferous approval by so many of a web of "philosophy," theory, or what have you, so sheer as this. From many personal experiences, I am convinced—though I may not be able to convince others—that there are those among us who either fail completely to understand, or if they do, are willing to misinterpret, the meaning of failure, every time panaceas are flashed in their eyes. They lack the understanding that failures in orthodontics are either the original or slightly changed conditions of malocclusion, which have been *treated* but *not corrected.* They also fail to understand that failures are either due to *incompetence* or to *unknown and uncontrollable factors* which interfere with the attainment of results. But even the factors, known to be the direct causes of failures, are numerous and variable. They need not be gone into now outside of mentioning the fact that *failures* present an entirely different problem from *relapses.*

Relapses, it should be understood, are disturbances occurring in cases which have been *successfully treated.* The term *relapse* is really a misnomer in orthodontics. *Relapse* means a return to a former bad state. The queer thing about relapses in orthodontics is that though there is a "return" to a "bad state," it is, usually, not exactly as it was before and, often, decidedly different. Failures and relapses share in common the fact that both are dilemmas to orthodontics. But what they do not have in common is the way out, though resorting to compromises makes it appear so.

The increasing trend toward, and reliability upon, compromises in treatment is deeply rooted in the illusion of a "cure-all," or in the belief of a simple solution to a complex problem—hence, the popularity. What is not so popular is the fact that there is vastly more we have to learn about orthodontics than what we *know* or what we *think* we know. Resorting to compromises, such as extraction of teeth in children without due regard for later consequences, is an arrogant assumption of cocksureness and a barrier to further progress, not to mention the injustice to the patient. Compromises may be permissible or even desirable, but only in *unusual* cases, and should be *considered as rare exceptions.* Even so, I should not choose to be held responsible for destroying the integrity of dentitions in children who have not yet attained dental maturity. When it is done, in 50 per cent or even 60 per cent of the cases treated, as reported in New York, March 7, 1944, by Dr. Tweed, the mutilation of preadolescent dentitions seems to be taken much too lightly.

Compromises by extractions do not solve orthodontic problems whether of failures or of relapses. They aggravate them. Solutions depend primarily upon a thorough grasp and complete understanding of *all* the ramifications entailed in the problem. And no one has yet filed any exclusive claim on that. The fact that conscientious and highly competent orthodontists are annoyed by the crowding out of an incisor tooth from perfect alignment after it had been put there is very disturbing. But that the same orthodontists are highly gratified on having the

incisors in "perfect" alignment at the sacrifice of four other teeth is rather alarming. To my way of reasoning, there is some quirk somewhere. Confidence in the promise that the incisors cannot do the same trick after the extraction of premolars must be considered just wishful thinking until proved to be otherwise. First it was third molars, now four more teeth. What next?

I, too, had daydreams when I first got started. When I came to, I learned that proof of experience usually turns out very differently. That is how I first learned something of great importance. I learned that I had to learn more than I was sure I knew. One of the many things was that perfection in alignment of teeth in orthodontic practice cannot be measured as some do—by prosthodontic yardsticks. It sometimes strikes me as though the idea of setting the teeth on "top of the ridge" is an inspiration of prosthodontic origin. There are still some among us overlooking the fact that prosthodontia and orthodontics are concerned with the opposite extremes in the life cycle of teeth. The orthodontist is at the beginning, the prosthodontist at the end of it. The orthodontist aims at preparing the teeth for their life work, the prosthodontist to imitate them by artificial makeshifts.

Other things to know are that teeth of orthodontic patients are natural products of great antiquity. They are known to align themselves in a way which was acquired long ago and which has been transmitted from generation to generation for untold ages. Then, also, teeth do not get into alignment at one moment. They do not even appear all together.[8] There is real individuality in the coming of teeth. Some may join the mate on the other side of the jaw or an antagonist in the opposite jaw, but their independence is always identifiable. When they erupt they do it gradually. Some are faster, some slower. The singular thing about it is that few, if any, teeth start to erupt on the spot where they are going to serve when in functional action. They all keep on drifting there as long as they keep on erupting; and some do that even later. The end result is that, depending upon many circumstances which cannot be discussed now, some of the teeth actually do get into so-called "perfect" alignment, while very many more get into good enough alignment to perform satisfactorily their functions of mastication, speech, and whatever else is required.

The orthodontist is not content with good enough. It must be "perfect" to be of aesthetic significance. As a consequence, the alignment of teeth may be looked at from two orthodontic vantage points: One is the physiologic and the other the aesthetic. The physiologic point of view is that teeth are of importance in so far as they perform those functions which are of biologic significance; such as, sustenance of life and preservation of health. To that end, the dentition should be "normal," though not necessarily what orthodontists consider as "perfect" or "ideal."

The aesthetic viewpoint is that teeth are of importance in so far as they enhance their own beauty by their form, size, and arrangement and the effect upon the beauty of the face. To that end, it seems that the most essential feature aimed at is "perfection" or "idealism," but *only* in alignment, even if it has to be gained at the risk of destroying anatomic integrity and physiologic efficiency.

If we examine carefully the teeth of people, living under conditions restricted by nature, environment, and circumstance, who must thrive on such

necessities of life as are available without personal preferences, we are bound to learn a good deal about the real significance of teeth.* What is easily learned is that early in life the teeth among those people are relatively greater in number, better formed, in more favorable position and in better occlusion than among ourselves. That is, there are among them more individuals with far superior dentitions than among ourselves. But despite the greater frequency of superb dentitions in normal occlusion, it will be found that in none of them are the teeth so faultlessly aligned as to be considered orthodontically "*perfect.*" Thus, in twenty different racial groups with high percentages of superb dentitions in normal occlusion, I found that many among them (from 26 per cent in African Negroes to 71 per cent in American whites) have one or more of the lower incisor teeth crowded or slightly rotated. According to prevailing notions and popular attitudes, such dentitions cannot be considered normal because they are much like those "relapses" occurring in cases with "bimaxillary protrusion." Judged by such standards, these dentitions should then be condemned to the loss of four premolars and the consequent effect upon occlusion.

As professional folks, we all too often seem to forget that "normal" in dentitions is not "perfection" and cannot be measured by celestial or divine standards. The "normal" in anatomic and physiologic features need not be 100 per cent perfect to be adequate for the needs of life and health.[9] Moreover, it should be realized that the "normal" in multiple organs cannot be perfect because they are never uniformly identical either in size, position, or function. Even when just doubled, normal organs are not exactly alike. Handedness may be mentioned in this respect. Eyes, ears, arms, legs, fingers, and toes are other outstanding examples of dissimilarity, though not necessarily of abnormality. How can the dentition, consisting of so many more parts, be expected to be 100 per cent perfect even under normal conditions?

Does the orthodontist really think that he is better than Nature, Providence, or the Almighty, when he expects to attain 100 per cent perfection in reclaimed or salvaged dentitions, dentitions which started off and grew up under abnormal conditions, such as are presented by some of the extreme forms of malocclusion? If so, he might be reminded that the machinery he uses in doing it is far too dangerous. The damage he is inflicting, such as irritation of gums, resorption of cementum, dentine, bone, devitalization of teeth, is far too serious. Are such effects of orthodontic manipulation more favorable than the natural processes entailed in growth and regeneration under normal conditions? He might also be reminded that if those who are 100 per cent idealists would take the trouble to investigate their own dental or occlusal perfections and imperfections and try to find out what the real significance between them is, they would learn a great deal. They might at least learn to ponder on the significance of a comparison between a complete dentition with some crowded incisors or a crippled dentition with the incisors in even alignment. They might also ponder on what is to happen to those cases of decided malocclusion, who already have beautiful faces and whose teeth are by nature evenly

*One need not go to the ends of the earth to do that. Our museums of natural history harbor enough samples of skeletal material to furnish sufficiently reliable information on that.

aligned in their respective arches. And what about evenly aligned dentitions in normal occlusion with spaces between the teeth?

Answers to such questions rest on decisions which every orthodontist is obliged to make for himself. If compromise is the answer, then orthodontists need bother no further, because their problems are solved completely and forever. But it should be realized at the same time that solutions, based on compromises, also compromise fundamental principles and the allegiance to them. Already the word "racket" is becoming much too audible. If the conviction is that fundamental principles are essential and indispensable, then it holds out a challenge. The challenge is to meet exigencies as exceptions, but without curtailment of principles. This can be accomplished (1) by realizing the truth that the problem of failures and relapses is not enshrouded with the mysteries of mechanical wizardry alone, (2) by waking up to the fact that, besides incompetence which no one will admit, we are in almost complete ignorance of the specific factors causing relapses and failures, (3) by making the earnest attempt to learn more about them at once. Our hope therefore hangs on the decision to admit and face our failures or relapses, explore the unknown about them, and search for the reasons of their occurrence. It is certainly not by obscuring them with compromises that we can hope to find out what is bringing them about and how best to avoid them. In the glimmering light of cumulative evidence gathered from studies of my own experiences in the last thirty-three years, there is more than a ray of hope for success in a scientific solution of this problem. But until complete knowledge is available to explain more fully *why* relapses and failures occur, every effort should be exerted to abide by those fundamental principles which set orthodontics up and made the world take notice. Resorting to expedient compromises only serves to add on more orthodontic wreckage to that already piled up in the wake of panaceas that failed before.

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ANATOMICAL AND CLINICAL PROBLEMS INVOLVED WHERE EXTRACTION IS INDICATED IN ORTHODONTIC TREATMENT

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IDEALISM is an objective "sought after by many; attained by few." Nevertheless, as orthodontists, when we essay to render assistance in the development of a normal dental mechanism, our stimulation should be so directed that Nature's architectural plan may be carried out, so far as this is possible. If success crowns our effort, there should ensue normal relations of the maxilla and mandible with cranial anatomy, and positioning of the teeth in harmony with the "*line of occlusion*—the line with which, in form and position according to type, the teeth must be in harmony if in normal occlusion" (Angle).

For many years after this fundamental principle of normal occlusion was laid down by Dr. Angle, very few, if any of us, possibly not even Dr. Angle himself, understood its full significance. It is very gratifying to realize how perfectly this principle, set forth so long ago, fits into the picture of normal occlusion as some of us understand it today. It required a number of years of clinical research in practice to find out just where this line of occlusion really lies, during which period there was more or less failure in many of our treated cases.

The part assigned to me in today's panel discussion, and that of Tweed, are so closely allied that there may be, naturally, some duplication; but where this happens, it will only tend to emphasize the points under discussion, for I believe that our views will pretty well coincide.

The foundation, or base, of the maxillary bones has been known under several names. I have been referring to it as "the main body of the bone"; Lundström has called it the "apical base"; and Tweed, "basal bone." I have, at times, applied all of these, as well as other terms.

Near the end of the last century, when the treatment of malocclusion was in its infancy as a science, and mechanical appliances had not reached the refinements of today, there was quite a controversy between Dr. Angle and Dr. Case concerning the problem of extraction in orthodontic treatment. There were, probably, at that period, only those two men devoting their full time to the study and practice of orthodontics. Knowledge of the etiology of malocclusion at that time was meager, and there was not a well-established scientific basis to guide practitioners in the analysis and treatment of their cases, except that they knew what was normal in the interdigitation of the cusps of the teeth when the jaws are closed. Under the handicaps mentioned, the removal of teeth did not work out very well, nor does it today except in the hands of those who know the location of the line of occlusion and are skilled in the use of efficient appliances with which the teeth can be placed under complete control.

Many of my treated cases twenty-five years ago, which I thought looked like ideal results, collapsed more or less, chiefly as the result of uncorrected

Read as part of the Extraction Panel at the meeting of the American Association of Orthodontists in Chicago, April 26, 1944.

forward translation. The first indication of this collapse, as most of us know, is a tendency to rotation of the mandibular incisors. This is due to that ever-present tendency of the buccal segments to move forward. It was in 1926 that I first resorted to extraction of four dental units in the more extreme cases, in order to remove this forward urge on the canines and incisors, and thus make it possible to carry these teeth back to where, I then realized, they belonged. This also enabled me to establish the upright position of these teeth and to intrude them to the normal plane of occlusion. If this is perfectly accomplished, the tendency to rotation of the anterior teeth is entirely removed, thereby reducing retention to a minor problem, providing that a normal overbite (1.5 mm.) is established, and that any other disturbing factors present are eliminated.

Apparently, there are still a few among us who believe that *nearly* ideal growth and development is possible in all cases, but the number of those who hold this view is rapidly decreasing. May I quote Noyes,[1] who says: "After thirty years of experience, I am satisfied that, given reasonable biologic vigor of tissues, normal nutrition, and patient cooperation, a *very nearly perfect* (italics mine) human denture can be produced with *approximately ideal* (italics mine) cusp relation. I do not believe that the potentialities of the individual can be altered or his individual type changed."

This is the old theory, under which many of us older men shed "sweat and tears" in our efforts to help establish it as a scientific fact. But, in the absence of full masticatory function, due to the consistency of the food of the present day, it just could not be accomplished. Discovery of the error in this theory is chiefly due to the ingenuity of the so-called *mechanics* in the orthodontic profession. Note that Noyes says "a very nearly perfect human denture," and "approximately ideal cusp relation." It is these *very nearly perfect* and *approximately ideal* results that, in many instances, do not remain stable. Further, I believe that correct knowledge of the line of occlusion, and skillful treatment based thereon, will remove interference and stimulate Nature in her work of developing the potentialities and true type of the patient. This possibility will become more manifest when we see some illustrations of a treated case near the end of this paper.

Concerning mechanical stimulation as a factor in initiating growth in the maxilla and mandible, some of the men now studying what is taking place in the way of growth and development in these areas contend that my claim is not backed up by scientific evidence. Surely, the many cases which I have reported in the literature must furnish all the proof necessary that my declaration is well founded. After many years of clinical experience, I *know* that any desired amount of forward growth of the mandible, or forward placement, whichever it is, can be fully obtained in healthy teen-age patients. In a recent paper[2] of mine, read before the New York Society, may be seen the report of a case of a man, 24 years of age, where quite noticeable improvement in facial balance has been obtained at an age when, in the opinion of some men, growth activity has ceased.

Realizing, as most of us now do, the truth of Dr. J. Sim Wallace's[3] theory of forward translation, our eyes have become more acute in recognizing the absence of normal growth of the maxilla and mandible, and consequent inhar-

mony of tooth material with foundation structures, and are able to obtain a more clearly defined outline of Dr. Angle's line of occlusion, which furnishes us with a scientific guide in the analysis and treatment of malocclusion. As a result of lack of normal backward growth of the bony bases, we have, in some instances, a forward displacement of the teeth so great that it is impossible to carry them all back into normal axial relation with the foundation structures, so removal of some of the dental units becomes unavoidable.

Where the extraction of four teeth is indicated, the ideal ones are the first premolars. Occasionally the prerogative of this choice does not rest with the operator; one or more teeth may already have been lost, or some may be congenitally missing. There may be broken-down first molars, or some of these, or other teeth, may be carrying large fillings which threaten to involve the pulps. Where there is no more than one missing tooth in a segment of the arch, and the third molar is present, I believe it is good practice to close the space, unless the missing tooth is a maxillary central incisor. If one maxillary lateral incisor is missing, and all the rest of the teeth are present in this arch, it is, usually, my custom to remove the remaining lateral incisor and close both spaces. It is unfortunate when this condition presents, but the operator has no alternative other than a prosthetic replacement. I believe that it is better to have both canines in contact with the central incisors, rather than one. Where the canines have been moved over to contact with the central incisors, they are in an area of limited bony covering on the labial aspect, so they should be placed as far lingually as possible; a little grinding might be done on the palatal surface to facilitate this. In a paper,[2] before mentioned, I reported a case where it was deemed advisable to remove four teeth. The left maxillary central incisor was pulpless, and the condition of its root was such that this tooth had to be sacrificed. The right lateral incisor was also removed; both spaces were closed, the left lateral being moved into the location of the left central and a jacket crown placed upon it, built out to match the right central. Two premolars were removed from the mandibular arch, and the spaces closed.

I have been asked the question, where premolar teeth have been removed: "What happens when we attempt to move teeth, such as the maxillary canines or first molars, into the canine fossa?" When I started, nearly twenty years ago, to consider extraction of premolars in orthodontic treatment, the relation of the mesiobuccal root of the maxillary first molar to the canine fossa was the first problem that entered my mind. Where we have a bodily forward translation of the maxillary teeth, the mesiobuccal roots of the first molars are already encroaching into the area of the canine fossae, and the canines into the incisive fossae. If it were impossible to have sufficient bony covering in the canine fossae for the molar roots, all the maxillary teeth would have to be moved distally, or a molar on each side removed and all teeth anterior to this molar carried back. The canine would never, under any circumstances, be placed in the canine fossa.

In the many cases where I have had four premolars removed, during the past eighteen years, there has not been one instance where the mesiobuccal root of the first molar has become denuded of overlying tissues, nor has there been any tendency to atrophy over the few canines that have been moved into the incisive fossae, to take the position of the lateral incisors. There is grave

danger, however, of atrophy occurring over teeth that are not standing within the confines of the cortical plates, and upright over basal bone. The old tendency to broaden the dental arches, and carry the incisors forward, beyond what is normal for the type of skull, in an effort to relieve crowding, is sure to result in atrophy and, finally, in more or less relapse of the case.

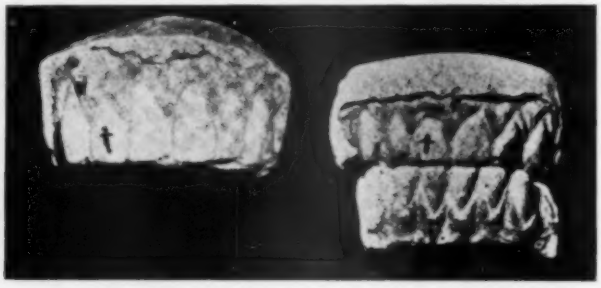

Fig. 1.

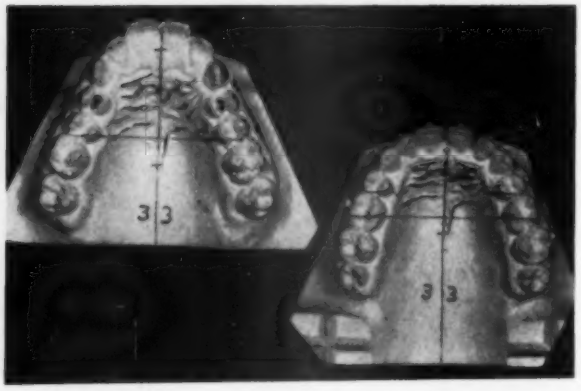

Fig. 2.

Apropos of this problem of recession at the gingival border, Fig. 1 is of interest. The right lateral incisor, in the cast on the left, carries a porcelain jacket crown, which had been on for fifteen years when this cast was made. Note the atrophy overlying all teeth shown, except the one with the crown. In the cast on the right—the teeth of an adult—there is also a jacket crown on the right central incisor, placed when the patient was 15 years of age. The same condition presents here also. Both crowns were placed by Dr. John F. Ross, of Toronto, an expert in porcelain work. These crowns were baked on a platinum shell, which was the regular technique at that time. All enamel was removed from the roots, as well as a little of the cementum—sufficient to bevel the root end. The platinum shell was made of about 28 gauge plate, and was fitted to the beveled root under the free margin of the gum tissue. This preparation, apparently, somewhat reduced the pressure on the overlying soft tissue and, possibly, was a factor in the absence of atrophy over the crowns, which developed over all the other teeth shown in the pictures after the crowns were placed.

An interesting anatomic reconstruction is shown in Fig. 2. Many years ago there was a controversy as to what happens to the rugae, overlying the palate process of the maxillary bones, when maxillary anterior teeth are car-

ried back. Fortunately, in this palate, there were two short transverse lines—one just lingual to the central incisors and one in line with the first molars. These lines gave us landmarks from which to make measurements. You will see that the rugae, during the backward movement of the teeth, have been compressed quite markedly. In the original cast the distance between the landmarks was 0.57 inch, and, at the completion of tooth movement, 0.41 inch—a difference of 0.16 inch.

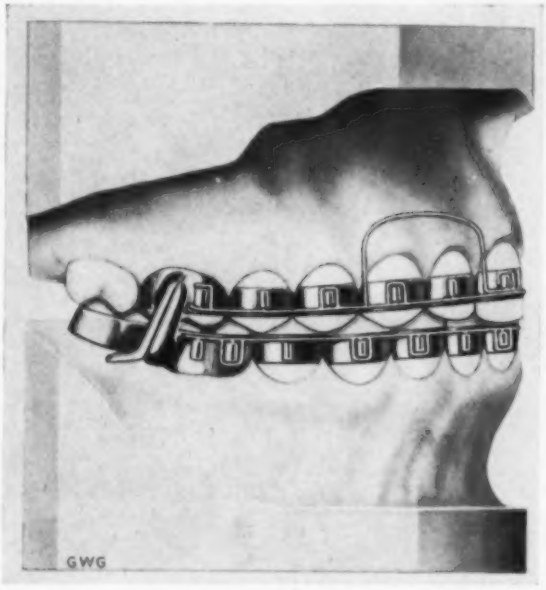

Fig. 3.

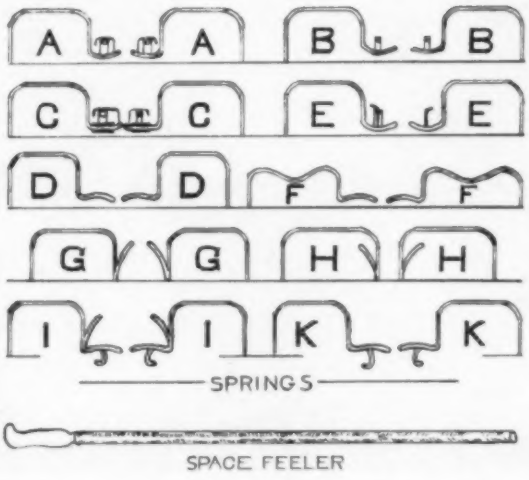

Fig. 4.

Classification of malocclusion should be on the basis of the relations of the jaws to cranial anatomy; so, in Angle's Class II, we should have only those cases where the mandible is in distal relation to the cranium, regardless of the axial cuspal relations of the teeth. I doubt if any of the methods used to correct these true Class II cases measures up with that of the buccal planes, Fig. 3, developed by me and presented, in the first instance, at the Atlanta meeting

of this Society in 1925. Clinical technique in the construction of these planes may be found in the INTERNATIONAL JOURNAL OF ORTHODONTIA, October, 1927. Not many men, so far as I know, use this method, but those who do not are missing something, for it is very efficient when properly applied. If, in over thirty years' practice of orthodontics, I have evolved anything at all worth while, it is

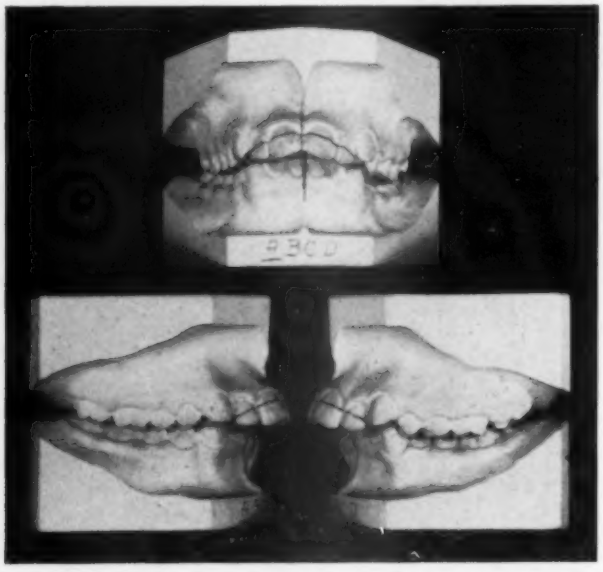

Fig. 5.

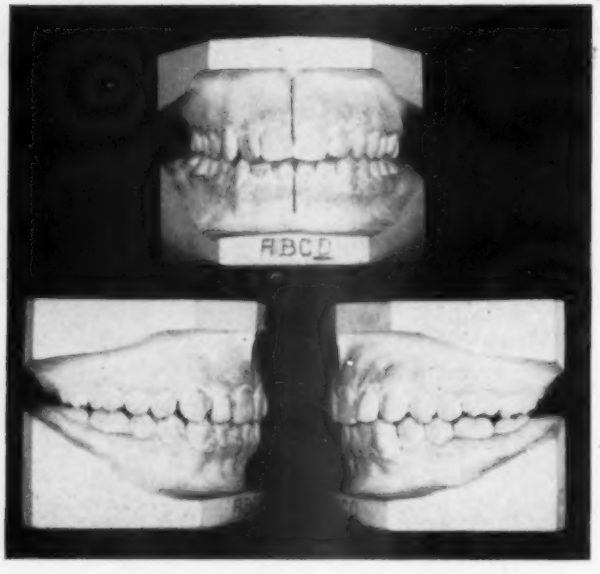

Fig. 6.

this method for stimulating forward growth of the mandible. There is no use "splitting hairs" as to just what takes place—forward growth or forward placement, so long as the desired result is obtained and remains stable.

In the correction of those cases where some dental units are removed, I find the springs, shown in Fig. 4, very efficient. These can be used with the edge-

wise mechanism, as well as with the pin appliance, which latter appliance I use, and possibly with other types of appliance. With the edgewise mechanism the 0.021 square wire should be used for the spring, where it is desired to attach it in the bracket, or a round wire squared at the end to fit snugly in the bracket. Two small spurs are soldered to the spring, one to fit against each side of the bracket. The spring is tied into the bracket in the same way as applied to the main arch wire, which latter is stepped occlusally to clear the bracket to which the spring is attached. Detailed technique in the use of the U springs may be found in a paper[4] read before the New York Society in 1940.

Fig. 7.

Permit me, in closing, to proffer further evidence that extraction, under duress, of even four first molars in some instances, does not preclude the possibility, through recourse to skillful mechanical stimulation, of bringing about harmony of the maxilla and mandible with the cranium. Fig. 5 shows the original casts in one such case. In this instance all first molars carried large fillings. After careful study, it was decided that four dental units must be removed, so these molars were chosen as the ones to go. Fig. 6 shows the finished casts, and Fig. 7 the facial result. I am satisfied to rest my case in this panel discussion on the opinions of those in the audience here today, and the readers of this paper, as to whether this "expedient compromise" has resulted successfully or not.

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DOES SCIENTIFIC INVESTIGATION SUPPORT THE EXTRACTION OF TEETH IN ORTHODONTIC THERAPY?

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INTRODUCTION

ALL clinical procedures are based on hypotheses which are in turn based on experience or on investigation or both. But the hypothesis itself is an interpretation of the experience or of the investigation, and interpretations are matters of individual judgment and subject to all of the variability of this quality. If either experience or investigation could finally settle any question to everyone's satisfaction there would be no need for a panel such as this. Since this is not the case, we have no alternative other than to examine all of the available evidence, whether derived from experience or from investigation, and, on the basis of such an examination, to determine our course of action. But even after examining the evidence each of us will draw our own conclusions, and our conclusions will vary according to our individual temperaments and background. This is fortunate, of course, because without differences of opinion there could be no progress.

THE STATEMENT OF THE PROBLEM

In the problem under discussion, as in any problem, there must first be a clear-cut statement of what we are trying to determine. This is particularly true in the present case because it seems as though a number of dissimilar matters have come to be thought of as being inseparably correlated. Thus the extraction problem has been said to revolve around such diverse items as the axial position of the lower incisors, anchorage, esthetics, adequacy of supporting bone, and the stability of final result. Each of these is a variable and each is a separate problem. No investigator would attempt to study them as a unit. The research worker always seeks to eliminate or control every variable except the one he is studying. Having settled the first, he goes on to the second and thus continues until he has examined all of them individually. It is usually not until then that he is in a position to test them for correlation. Since my part of the panel is the production of evidence derived from investigations, I shall be forced to follow this procedure and will take up each of the mentioned items separately.

THE AXIAL INCLINATION OF LOWER INCISORS

Several years ago when there was much discussion about the relation of these teeth to the mandible, we undertook a brief study to determine just what this relation was. We examined 36 Class I cases, 43 Class II, Division 1 cases, and 15 Class II, Division 2 cases, a total of 104 cases. The cephalometric roentgenograms taken prior to treatment were traced and the axis of the lower cen-

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tral incisor was related to a line tangent to the lower border of the mandible. This relation was read in degrees by means of a standard protractor. Means or arithmetic averages were derived for each of the three groups with the following results. Class I gave a mean angle of 90.9 degrees, Class II, Division 1 a mean of 89.3 degrees, and Class II, Division 2 one of 86.6 degrees. Thus in this sample at least, there was a difference in the means of Class I and of Class II, Division 1, of only 1.5 degrees. Class II, Division 2 differed, however, from these two by 4.3 and 2.74 degrees, respectively. But since the sample was composed entirely of malocclusions, we did not attach too much significance to the findings. We felt that there was the possibility that malocclusion and tipping of the incisors might be correlated phenomena. But our interest was attracted to the great ranges exhibited as shown graphically in Fig. 1. These ranges were 28 degrees for Class I, 35 degrees for Class II, Division 1, and 42 degrees for Class II, Division 2.

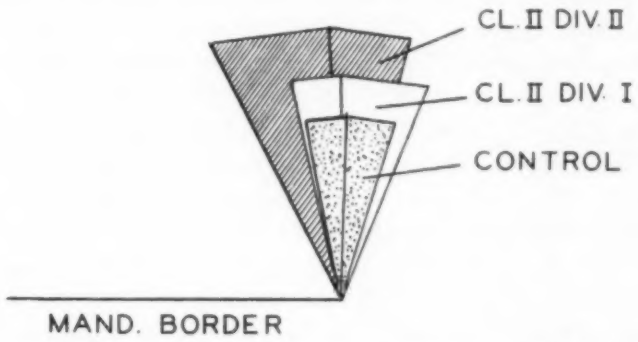

Fig. 1.—Diagrammatic representation of data on axial inclination of lower incisor.

The findings of this study were given before a small group of orthodontists, among whom was one, Dr. Rushing, who had just completed an almost identical piece of work. Rushing had employed the same tangent to the lower border of the mandible as a plane of reference and had conducted his work on fourteen living individuals and nine skulls, all exhibiting normal occlusion. Even on this small sample, the means and the ranges were almost identical to ours.

Of more recent date is the work of Dr. Speidel, who reported his findings at the Research Section of this meeting. Speidel's sample consisted of forty-two young male adults, "who had definitely superior, to almost ideal, dental occlusal relationships." Speidel employed a tangent to the lower border of the mandible as a plane of reference. The mean was found to be 92.64 degrees with a standard deviation of 6.15 degrees. The total range of the sample was 28 degrees. Thus, from three widely separated sources we have samples that yield findings that are remarkably close, within 2 degrees in the case of the means, and all showing large and similar variations both in the normal occlusions and in the malocclusions.

These studies exemplify once more the fallacy of employing a mean as a criterion for the individual. With such a large range in this angle it would be impossible to employ it as a basis for clinical judgment. It would seem but logical to conclude that the axial inclination of the lower incisor, like any

other anatomic feature, varies greatly and is probably just as much a part of the individual's pattern as are the other details of his physiognomy. That it changes very little during life is shown by Broadbent, who examined twenty-five white males at three stages between the third and the eighteenth year. At 3 years of age the deciduous incisor stood at 92 degrees, at 16 years its successor stood at 96 degrees, and at 18 years it had returned to 94 degrees. This feature is undoubtedly just as dependent on such factors as ethnic origins and genetic admixtures as is any other, and to insist that all lower incisors must stand upright to be considered normal is just as untenable as to insist that all foreheads be high or all noses of the Roman variety.

Before leaving this point, however, I should like to say that I am glad that these teeth have finally begun to claim the attention they deserve. For too long they have been arbitrarily pulled or pushed labially into alignment with no attention paid to their axial inclinations. They are apt to be tipped labially during most orthodontic treatment of the lower arch, and this tendency is increased with the wearing of intermaxillary Class II elastics. We showed this quite conclusively in 1938[1] and also the fact that if these teeth were disturbed during treatment they showed the same tendency as other features, viz., to return to their pattern relationship. This tendency decreases with age, however, and every effort should be made to disturb them as little as possible during treatment. We readily subscribe to the idea that if they are disturbed it would be more desirable to tip them lingually, providing this could be done, and done without disturbing their apices. Our ability to accomplish this movement would depend, from the mechanical aspect at least, upon the availability of sufficient anchorage. This brings us to a consideration of our next subject.

THE ANCHORAGE PROBLEM

Anchorage has always been the orthodontist's hardhearted master, and although we may have progressed in our control over it, we have by no means conquered it to date. Early in orthodontic history it was noted that forces applied to teeth for the purpose of moving them seemed invariably to cause tipping, with the apex remaining relatively undisturbed. Indeed, this was such a common observation that a number of writers expressed the opinion that it was well-nigh impossible to move them. But Oppenheim's experiments, beginning with those of 1911,[2] indicated that under certain circumstances the apex of a tooth could be moved, and with simple tipping devices and in a direction not intended by the operator! Oppenheim found that, upon the application of gentle forces, the reorganization of the alveolar bone began at the gingival border and progressed toward the apex. It was upon this evidence that he based his statement that a tooth did not move like a post in the ground, i.e., the crown did not go one way and the apex the opposite way. This finding has been disputed for years because another portion of his experimentation has been neglected or ignored.

Oppenheim subsequently demonstrated[3] that when strong forces were employed the neck of the tooth was jammed against the alveolar crest bone. He showed ruptured and thrombosed blood vessels at this site, the forerunners of necrosis. Such traumatized bone cannot react in a normal, physiologic manner. In such cases he found his typical bone changes remote from the site of injury,

in other words, where distance had attenuated the pressure to the point where it stimulated rather than destroyed. But during all of the time that the debris of injury was being removed, the point of pressure was acting as a fulcrum. This made the tooth a two-armed lever and the apex travelled in a direction opposite to that of the crown.

The introduction of Angle's first bodily moving appliances coincided quite closely with the publication of Oppenheim's findings although the two were not developed together. The pin and tube appliance was designed specifically "to grow bone" by moving the apices of teeth. Due to the extreme difficulties in its management, the appliance never enjoyed a wide popularity and was supplanted by the ribbon arch. Even with this appliance, rigid as it was, it was found that teeth would tip upon the application of pressure. In order to prevent this, the principle of torque was introduced. But torque for anchorage purposes was intended to be employed only to a degree that would make allowance for the slight amount of spring that was inherent in the arch wire so that if the tooth moved at all it would move bodily. Like every other good thing it was abused by many who believed that if a little is good, a whole lot must be better.

This brings us to the consideration of the idea that anchorage must be prepared before the pull of elastics is allowed to operate. We are told that teeth which are tipped back or uprighted are a better source of anchorage than those standing in their normal axial positions, and comparisons are drawn to tent pegs working against guy ropes. My own convictions on this point were stated in a paper in 1937.[4] At that time I said that an undisturbed tooth was the best source of anchorage. "The placing of so much as a single ligature for separation is followed by alterations in the structure of the surrounding bone which is weakened in proportion to the magnitude of the force and the duration of its operation."

In order to demonstrate the actual events which accompany and follow this procedure of preparing anchorage, I should like to show the record of one case in which it was done in the prescribed manner.

Fig. 2 represents the tracing taken from the lateral headplate before treatment was started and I do not have to describe it to this audience. For the first four months the lower teeth were subjected to tip-back bends, together with ligature retraction and expansion of the arch. Fig. 3 represents a superposed tracing of the original on that of another taken from the headplate made at the end of this phase of the treatment. This reveals that, although the lower incisor has been tipped lingually, the molar crown has not gone back, but the root apices have come forward to an appreciable degree. It shows further that the arch has been shortened anteroposteriorly, which shortening could have been gained only by overexpansion.

At this stage, Class III elastics were applied to complete the distal movement. After one month the clinical evidence of forward movement of the upper was so pronounced that a head cap was applied to this arch. Fig. 4 shows what was accomplished over the next three and a half months. It will be noted that the maxillary molar has been elevated, the almost invariable accompaniment of Class III elastics, and the maxillary incisor has been retracted somewhat through a shortening of this arch. The lowering of the

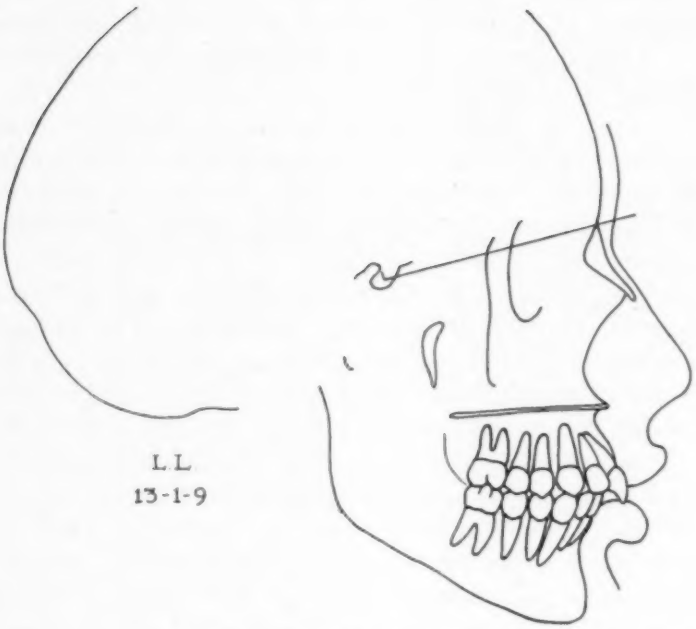

Fig. 2.—Tracing of lateral head x-ray plate of Case L. L. before treatment was instituted to prepare anchorage.

Fig. 3.—Tracing of lateral head x-ray plate of Case L. L. after four months' application of tip-back bends, ligature retraction, and expansion in the mandibular arch. Dotted lines indicate original tooth positions.

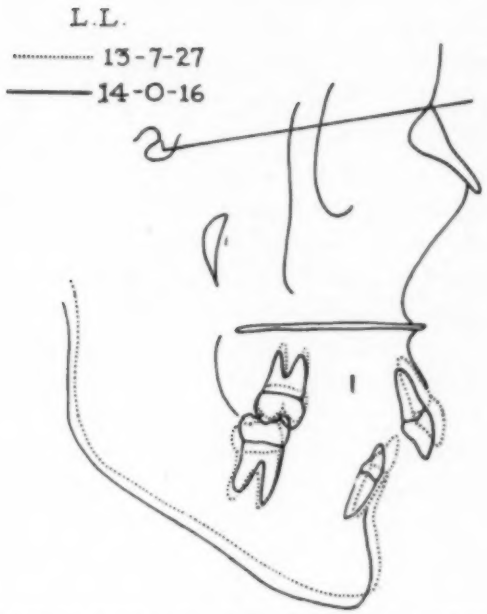

Fig. 4.—Tracing of lateral head x-ray plate of Case L. L. after 3½ months' wearing of Class III intermaxillary elastics, combined with head cap operating on maxillary arch. Dotted lines indicate previous tooth and jaw positions.

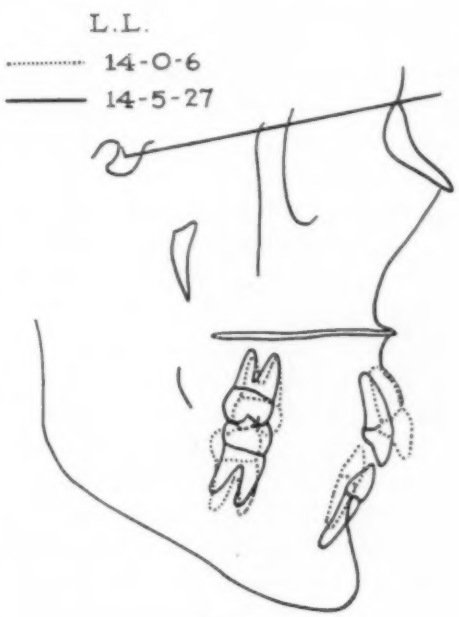

Fig. 5.

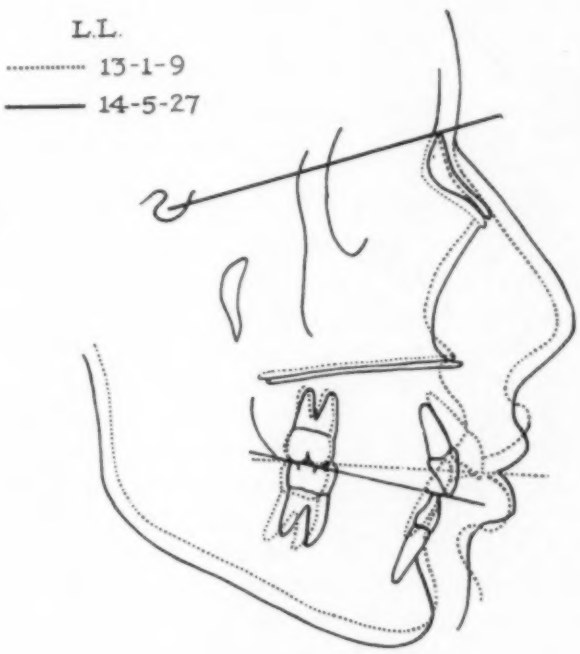

Fig. 6.

Fig. 5.—Tracing of lateral head x-ray plate of Case L. L. following 5½ months' treatment with Class II tip-back bends and intermaxillary elastics, combined with head cap operating on mandibular arch. Dotted lines indicate tooth and jaw positions at end of previous stage.

Fig. 6.—Superimposed tracings of lateral head x-ray plates of Case L. L. at beginning and end of treatment.

posterior end of the occlusal plane has opened the bite as indicated by the new position of the mandible. The superposed tracings of the mandible alone, reveal that there has been no molar movement of any kind but the incisor has been tipped slightly more to the lingual. This could only be possible through a further expansion of the arch.

The next and final phase of treatment naturally called for the setting back of the maxillary arch. This was accomplished by means of second order bends in the maxilla with Class II elastics during the day and head cap at night. This required between five and six months. Fig. 5 represents a comparison between the previous stage and the finished result. Now it will be noted that although the upper teeth have gone distally, the lowers have tended to realign themselves at their original inclinations. The new position of the mandible has been maintained. Fig. 6 represents a comparison between the first and last tracings. It reveals that both molars are slightly forward to their original positions, the lower more than the upper. The upper incisors have been carried downward and lingually. The occlusal plane has been tipped down in front and the mandible has been forced inferiorly and posteriorly. A superposing of the mandibles reveals that the incisors have been depressed but that their original axial inclinations remain the same. The molar, on the other hand, has gone upward half the height of its crown and forward one-third of its mesiodistal width. Thus the arch has been shortened by expansion and the molar now occupies a more unfavorable position than it did originally. Thus, at the end of a long period of treatment we find the case in a more unstable condition than it would be if it had been treated in the orthodox manner. I show it here only to make the point that teeth cannot be thought of as tent pegs nor orthodontics only as a system of mechanical procedures.

AESTHETICS

Under this heading no one at present can produce evidence that is anything other than subjective, that is, based on individual preference or prejudice. Each one of us has a different idea of beauty, and what appeals to one will not appeal to another. Our population is a hodgepodge of racial admixtures, and the faces produced under such conditions will range from the extreme of one pure type to that of another, with all intervening stages. The artist himself does not attempt to rate the beauty of pure types but rather accepts the Greek, the Assyrian, the Nordic, the Negroid, each as perfection in its own sphere. And each of these characteristic types is based on a normally occluded and complete set of teeth. If a convex or prognathic face gives rise to an unpleasant response in us, is it not just as possible that the straight profile would be equally offensive to the natives of the Solomons? The problem of the orthodontist is not to make the face of the normal person over again into something more to the operator's own liking. It is rather to concern himself with those cases in which there is disharmony due to some unfortunate misadventure of heredity, health, or growth, as indicated by malocclusion of the teeth. If he restricts himself to these conditions the problem of extraction reduces itself to just one question, viz., is there enough bone to hold all of the teeth in their normal relationships? This brings us to our next topic.

TOOTH-JAW RATIO

This problem has been referred to variously in the past as "inadequacy of the apical base," "teeth too large for the jaws," and "drifting off the base." It manifests itself in conditions that range from slight overlapping of contacts to the complete blocking out of teeth. It is being inferred that any lapping of contacts is evidence indicating an inadequacy of supporting bone, but we feel reasonably certain that other factors and forces can upset the delicate contact relations which we think of as normal. Among these are eruption and growth.

Textbooks have given us tables of eruption both in terms of chronological age and sequence of teeth but one does not practice very long before he finds that both of these may vary considerably. Some children have a complete second dentition at 10 years of age, while others go to college at 18 years with the second permanent molars just making their appearance. The *order* of appearance is only slightly more regular. It must further be remembered that teeth erupt as fully grown units and that the power behind their eruption is sometimes very great. A tooth under its impulse will force itself into the mouth regardless of obstacles.

The jaws, on the other hand, grow steadily and continuously although with a declining rate gradient. We have never been able, even in our longest series, to demonstrate accelerations or retardations. Thus we have two dissimilar processes, one of which makes its contributions in sudden large and unchangeable increments and the other of which increases gradually. It was formerly thought that the teeth, through their eruption, caused the jaws to grow. This concept we have been forced to abandon in the face of accumulated evidence.

Just as in the eruption of the teeth, so in the growth of the jaws we find great variation between different individuals. These variations are those of rate and of time. Thus an individual who is destined to be large may grow at a higher rate or he may merely grow for a longer period of time. Neither of these growth variables would be of importance if eruption were coordinated with specific levels of growth, but, as we have seen, the pattern of eruption also presents variables. Thus we may have precocious eruption associated with an average rate of growth, or a normal eruption associated with a slow rate of growth, both of which would lead to temporary disharmonies in the tooth-jaw ratio. Broadbent has characterized these conditions as "ugly duckling" stages. On the other hand, jaw growth is not infrequently ahead of eruption, with the result that there may be varying degrees of spacing.

Until we can read individual growth curves and make accurate predictions as to the cessation of growth, we have no recourse but to wait for the development of the full adult dentition, except third molars, before deciding that the arch will not hold its full complement of teeth. Extraction prior to this time is guesswork.

There is another aspect to this tooth-jaw relationship that I should like to emphasize. This relates to the *magnitude* of disharmony which may exist in any given case. For the sake of clarity I am going to assume that complete growth has taken place and that we are accepting the thesis that function will not develop bone. Conditions of lapped contacts in an orthodontic practice will range all the way from a complete blocking out of several teeth to a

slight lapping of a single contact in the lower incisors. A comparable mechanical arrangement would be exemplified by a series of troughlike boxes of varying length, just wide enough to accommodate billiard balls. The box which would just hold a complete set of balls, with each ball in contact with the next, would represent an harmonious tooth-bone relationship. The next smaller box might be only $\frac{1}{16}$ inch too short, yet this would be enough to cause one ball to protrude to an appreciable degree. Some of the boxes would be so short that a complete ball or even two would be prevented from going to place.

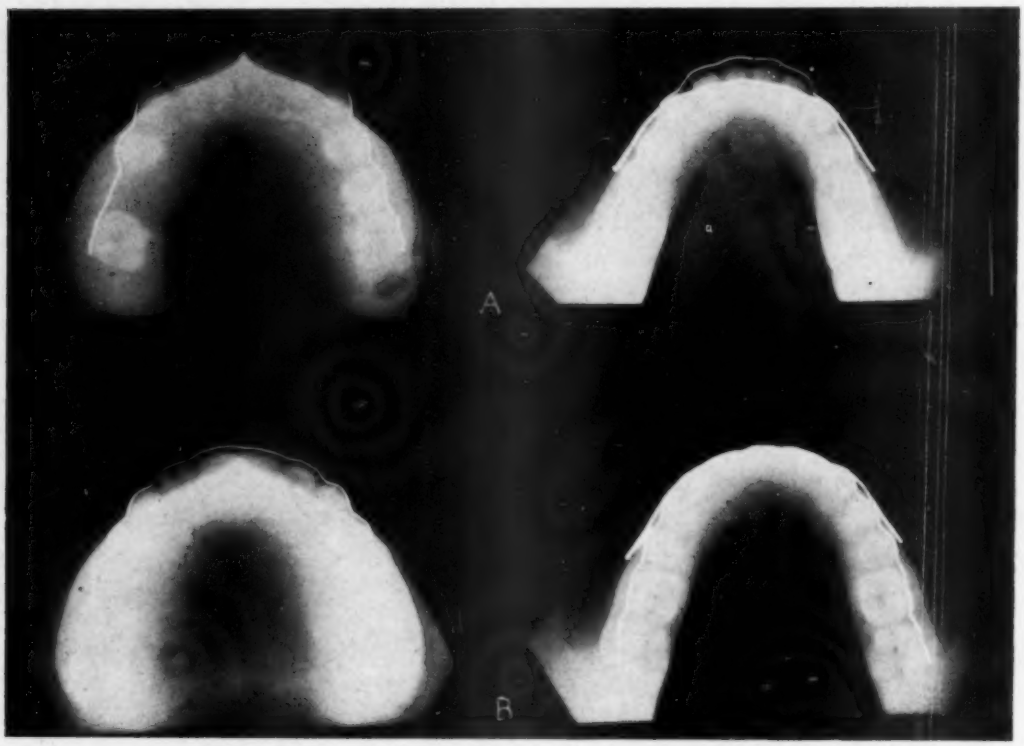

Fig. 7.—Figure representing x-rays of plaster models taken according to technique of Dr. William B. Downs.

Returning to the dental arch again, we note that a very slight disharmony will cause a lapping of contacts, particularly in the lower incisor region. Our occlusal relations may be perfect everywhere else, but we find one tooth with a persistent tendency to rotate or to drop out of line. We need but 2 mm. more space than has been supplied but seem unable to maintain it. Now the question I should like to pose is this: Are we justified in extracting two premolars in this arch, whose combined diameters measure 13 to 14 mm. (Black) in order to gain 1 to 2 mm. of space? Are we to sacrifice all of the advantages of a normal interdigitation of the buccal teeth and normal interproximal tissue conditions in order to align this one tooth? This seems like "straining at the gnat and swallowing the elephant."

The conditions presented at the other extreme, viz., where teeth are completely or nearly completely blocked out and the dentition is grown, are a quite different matter. Here we must realize that the good we might do by preserving all teeth may be offset by a long period of treatment at this age.

If we were to poll this audience on the question of whether or not to extract, we would find a few who would not extract under any circumstances and a few who would extract on the slightest pretense, but the majority today would probably be found between these two extremes. But even these would disagree violently on individual cases. Now can we ever look forward to the day when it will be possible to arrive at logical judgments in this regard on the basis of accurate measurements?

We feel that the problem of extraction will continue to be a matter of that greatest of all variables, human judgment, until a method is found to measure the relationship of tooth crowns to supporting bone. Dr. William B. Downs of our staff has been interested in this question for over ten years, and yesterday at the Research Section reported a new method for its investigation. It consists of the x-raying of accurate plaster models, employing a technique which reveals the outline of the dental arch and that of the alveolar process at the line of reflection of soft tissue. Fig. 7 shows such a film and it is apparent that a good idea is gained of the relative size of the arch and its supporting bone. Findings on this piece of work will have to be awaited until a sufficiently large sample of normal adult dentitions has been gathered. Until this is done, no predictions are in order, but it may then be possible to establish a ratio between these two variables that will be sufficiently narrow to be of clinical use. Even then, however, there will still be cases lying in the borderland, upon which only clinical judgment can be employed.

Fig. 8.—Frontal and profile photographs of Case M. S. before treatment.

The final phase of this paper will deal with the analysis of the treatment of cases in which extraction has been resorted to. The avowed objective of this treatment is to retract the canines and incisors and bring them back "on the ridge." The method employed was the re-enforcement of molar anchorage by tipping the molars up and back to get the "toe hold" necessary and the placing of traction loops opposite the sites of the extractions.

TREATMENT INVOLVING EXTRACTION

The first case is that of a boy, aged 13 years and 2 months, with a Class II, Division 1 malocclusion. It was not a typical case, but one that was complicated by an extreme leaning of the lower as well as upper incisors. The anterior teeth in both arches were spaced, the upper more than the lower. Fig. 8

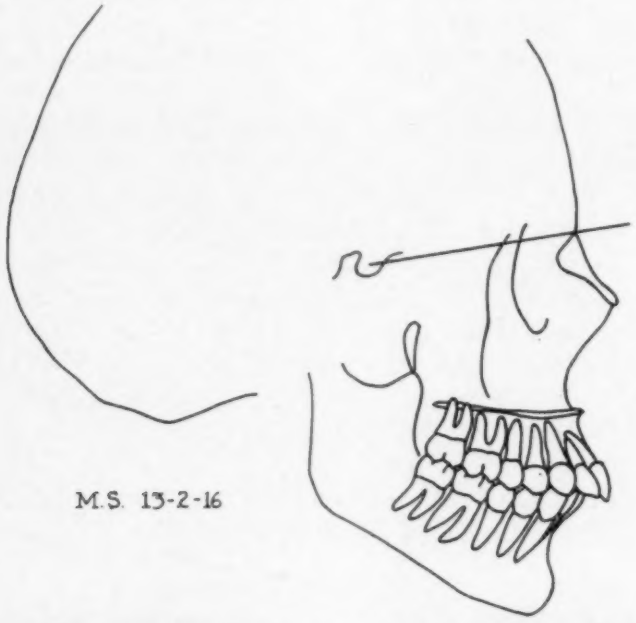

Fig. 9.—Tracing of lateral head x-ray of Case M. S. before treatment.

Fig. 10.—Frontal and profile photographs of Case M. S. at end of treatment.

shows the front and profile views of the boy before treatment. Fig. 9 shows the tracing of the lateral headplate at the time treatment was begun.

The operator felt that the uprighting of the teeth through the closing of spaces would not be sufficient to give the incisors the desired degree of axial

correction and he accordingly extracted the four first premolars. Following this he placed contraction loops opposite the sites of the extraction and retracted the anteriors. The resulting change in the patient's appearance is shown in Fig. 10; I think anyone would agree that it is a great improvement. Fig. 11 shows the change as exhibited in the models where the improvement is also borne out.

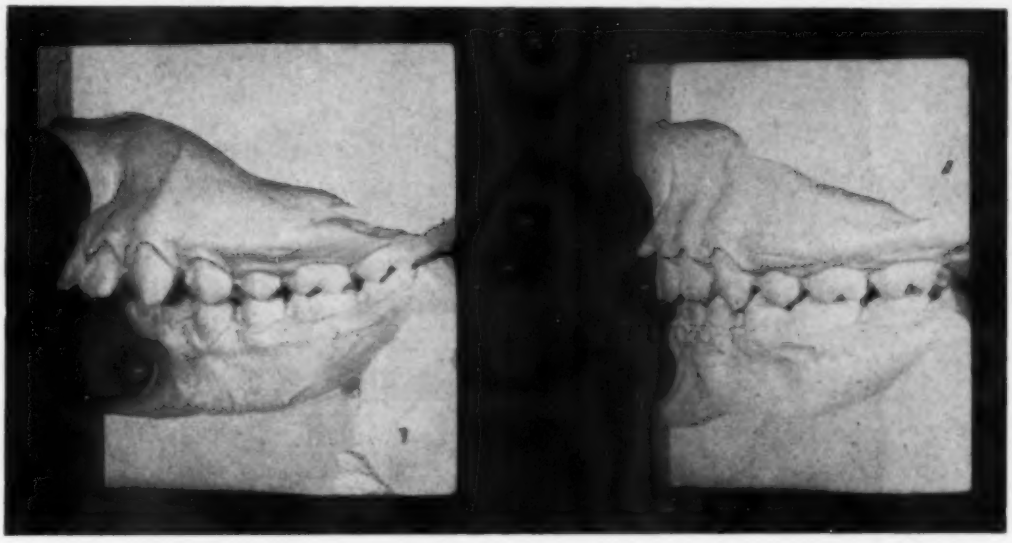

Fig. 11.—Lateral view of models of Case M. S. before and after treatment.

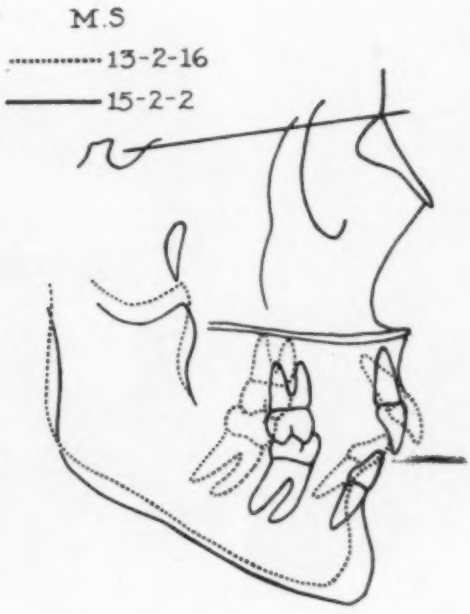

Fig. 12.—Tracing of lateral head x-ray plate of Case M. S. at end of treatment superimposed on that at beginning of treatment.

The change as revealed by the headplates is shown in Fig. 12 and several details should be noted. First, the molars have come forward practically their entire mesiodistal width. The lower incisor has been acted upon in such a way

as to behave like a two-armed lever, the apex having gone labially. This boy had plenty of bone in front of his incisor roots before treatment was started so that these are still well embedded. The case is still under retention and

Fig. 13.—Frontal and profile photographs of Case L. T. before treatment.

Fig. 14.—Frontal and profile photographs of Case L. T. after treatment.

still looks well, but I am informed by the operator that small spaces have appeared at the sites of extraction.

The next case is one of a girl with a normal occlusion but with an extreme alveolar prognathism. This was of such a degree that the lips could be closed

only with great effort as shown by Fig. 13. This case was undertaken only at the insistence of the patient and her parents and was treated in a manner similar to the previous one. Fig. 14 shows the change brought about in the face and Fig. 15 that revealed by the models.

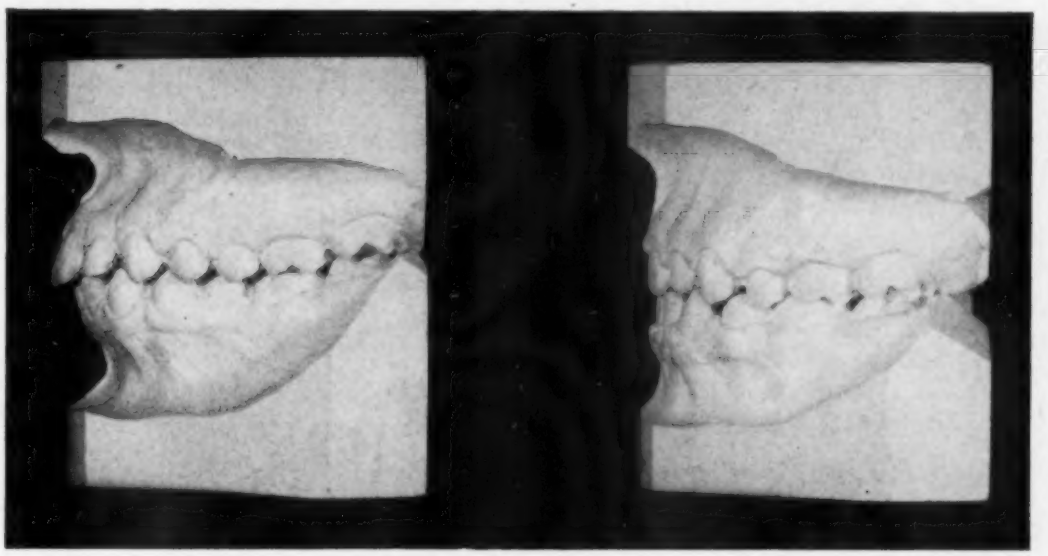

Fig. 15.—Lateral view of models of Case L. T. before and after treatment.

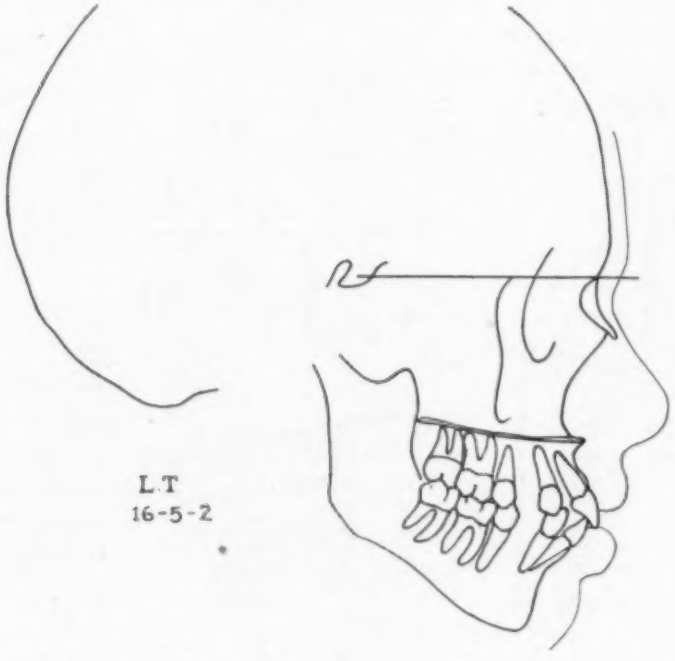

Fig. 16.—Tracing of lateral head x-ray plate of Case L. T. before treatment.

The headplate tracing of the case before treatment is shown in Fig. 16, and Fig. 17 shows the case at the end of treatment. This child did *not* have sufficient bone ahead of her lower incisors to stand the retraction forces that were employed. Again the teeth have been tipped as double levers, but in this

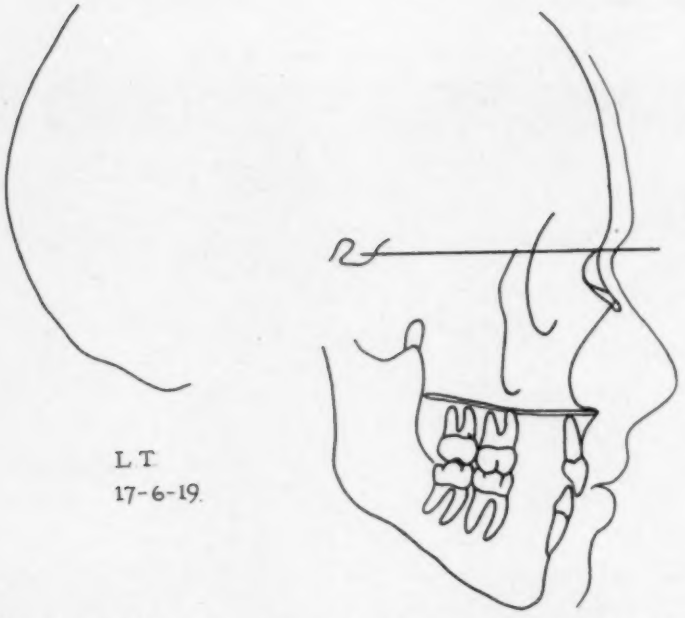

Fig. 17.—Tracing of lateral head x-ray plate of Case L. T. at end of treatment.

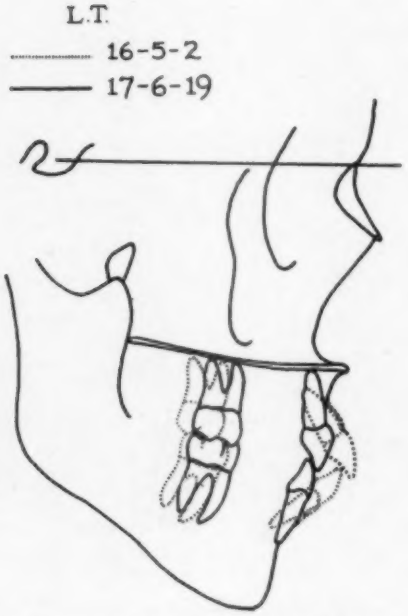

Fig. 18.—Composite tracing of Case L. T. before and after treatment.

case the apices appear to have been carried almost out of the alveolar process. Fig. 18 represents the composite tracings of the x-rays taken before and after treatment, and the same findings are evident that were seen in the previous case. The molars are all well forward to their original position and the axes of the incisors, both upper and lower, have been rotated about a point midway of their roots. Instead of taking the teeth "back on the ridge," they are farther off than they were in the beginning.

Only time and subsequent records will reveal the ultimate outcome of these cases, but the headplates show quite strikingly that things are not always what they appear to be in the photographs or the models, at least at the time of retention.

SUMMARY AND CONCLUSIONS

1. The axial inclination of the lower incisors is an individual characteristic which shows a great range of variability in any sample of normal or abnormal occlusions studied thus far. To accept its mean value as a norm is wholly unjustifiable according to any scientific standards.

2. The tipping back of teeth for the preparation of so-called "toe hold" anchorage has been shown to fail of its objective. We have followed many more cases than those shown here where it has been employed and have never seen one where the roots have not come forward as far or farther than the crowns have gone back.

3. We do not believe that we as orthodontists are qualified to pass on the beauty of the human face. Nature has cast each of us in a different mold and to attempt deliberately to alter the type of the face is presumptuous. Further than this, it is doubtful if such changes can be long maintained.

4. It is our opinion that the extraction problem reduces itself to a consideration of just one question, viz.: is there enough bone to hold the teeth in a normal and stable position following treatment? At present we have no accurate means of determining the relation between the mass of the tooth crowns and that of their supporting bone. Even granting the thesis that function will not increase the bone, we are still faced with the necessity for deciding the magnitude of disharmony which would justify the extraction of teeth. We do not feel that it is a sensible procedure to eliminate 13 to 14 mm. of tooth substance in an effort to gain 2 mm.

5. In those cases in which extraction has been resorted to, it has been demonstrated that the molars are brought forward to a considerably greater degree than the incisors are taken back. The latter teeth have been shown to behave as two-armed levers with their apices going farther forward than their original position. While it is possible that this reaction of the incisors is due to the employment of excessive forces of retraction rather than to the loss of dental elements per se, it should be pointed out that the extraction permits such forces to express themselves to an excessive degree. Thus the clinical judgment of the operator looms even larger with this method of treatment than with orthodox methods. The cases shown were treated by orthodontists of training and long experience; they do not represent the bungling efforts of the tyro.

The purpose of this paper has been to present certain evidence relative to the various conditions which are held to be correlated with the treatment of malocclusions by extraction. Whether this evidence supports or refutes the procedure will depend on the individual reaction of each one in the audience. There are undoubtedly those who have been thrilled by the transformation wrought in the last two cases shown, and there are those who have been shocked by the unexpected tooth movements that are evident. But regardless of individual reaction, it should be plain that the entire problem is not a simple matter of mechanics and that much study should be devoted to it before it is accepted as a panacea for all orthodontic ills. The practitioner tends to look at extraction as an "easy way out," whereas in reality it will frequently be found to complicate the treatment of a case.

In education, the reintroduction of extraction enormously increases the difficulties of teaching. With normal occlusion as a guide, we had a strong foundation of proved, biologic findings upon which to build a physiologic concept of the denture. Extraction as a means of treatment, and particularly when directed toward esthetic rather than functional ends, provides us only with an endless chain of variables, each of which is dependent on individual judgment alone.

My hope is that the present wave of enthusiasm for the extraction of teeth will recede to the place where the method is employed only when dictated by well-controlled evidence. It is dangerous for any profession to assume that everything that has been done in the past is wrong and that all of its previous findings are fallacious. In closing, I should like to read you a quotation out of the past.

> "It is much easier to extract teeth than to determine whether it is absolutely necessary. The extraction of a tooth requires nothing more, on the part of the practitioner, than a degree of facility in the use of instruments that are usually employed in this operation; whilst the knowledge necessary to appreciate the consequences can only be acquired by time and study." Delebarre, 1815.

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Editorial

The Panel Issue

If you are one who practices orthodontics, whether you correct one malocclusion a year or fifty, whether you are a general practitioner or a specialist, you should read this special Panel Issue of the Orthodontic Section of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY. It is timely, and comprises the up-to-date thought on the question of the extraction of teeth in the correction of malocclusion.

After reading the manuscript and noting the wide variation of opinion expressed, whatever your own opinion may be, one thing is certain: your perspective, your viewpoint, and your general conception of the entire orthodontic problem will be strengthened. It will make you think more intensely about the treatment of cases.

If you are an amateur and new in the subject of orthodontics, after reading this material you may say: "Here are plainly experts of many years' experience and background who cannot agree on one of the fundamental problems in orthodontics, whether to extract or not to extract teeth in the process of correcting malocclusion." And you will probably wonder how you are to know what to do and what not to do in this particular.

If you are an orthodontist of years of experience, however, it is quite possible and even likely that you will feel that this subject of extraction was pretty thoroughly thrashed out about the turn of the century, and that you are able to see but little change in the over-all problem now from what it was many years ago. You may belong to another group of thought, however, who may say something like this: "If anybody can do a more sightly piece of work and with less grief to all concerned by extracting a few teeth occasionally, then I am open to conviction, because it is my job to correct malocclusion successfully in a way that will satisfy the patient."

In any event, in this issue of the JOURNAL you will find concentrated thought as expressed by various leaders whose experience and background are sufficiently impressive to make their opinions important to the problem that now takes the principal spotlight in orthodontic interest.

Read this issue; then write to the Editor of the JOURNAL your personal opinion, so that a cross section may be secured upon this subject, in the nature of a Gallup poll. What do the majority of orthodontists think about this question in 1944? The answer to this question will be interesting to all of the readers of this JOURNAL whether the opinion is based upon personal clinical experience or upon scientific investigation.

H. C. P.

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Max E. Ernst, Secretary, American Association of Orthodontists, 1250 Lowry Medical Arts Bldg., St. Paul, Minn.

Department of Orthodontic Abstracts and Reviews

Edited by

DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

Ectodermal Dysplasia (Anhidrotic Type) With Complete Anodontia. A Serial Roentgenographic Cephalometric Appraisal: By Allan G. Brodie, D.D.S., Ph.D., and Bernard G. Sarnat, M.D., Chicago, *Am. J. Dis. Child.* **64**: 1046-1054, December, 1942.

The importance of the deciduous and permanent teeth in the development of the face and jaws has been a controversial problem for a long time. One purpose of this investigation was to determine by serial roentgenograms of the skull the development of the face and jaws from the age of 1 year and 10 months to that of 5 years and 4 months in a patient with complete anodontia. A further purpose was to compare this development with the normal as to size, proportion, and rate of growth.

Report of a Case.—E. Z., a white boy aged 1 year and 9 months, was referred to us on May 18, 1938, because teeth had not appeared in the oral cavity.

The mother had a normal pregnancy and delivery and the infant was an apparently normal, full-term, 3,775 gram boy. The growth and development of the child during the neonatal and infancy periods were normal. He was given a diet consisting of breast milk (until 7 months), orange juice, and cod-liver oil under the direction of the physician.

At 1 year and 9 months, the patient was referred to us after a physician had taken intraoral roentgenograms and found no evidence of tooth development.

The presence of eczema and the lack of hair were noticed at 3, and at 6 months of age, respectively. The patient did not perspire, and it was necessary to apply cold wet packs in order to keep him cool on hot days. The father and mother were of Polish descent and had no other children. Neither parent nor any relative of the parents was known to have a condition similar to that of the patient.

Physical examination revealed a well-developed and well-nourished, mentally alert boy, with albinoid, lanugolike hair sparsely distributed over the scalp. The skin was dry and scaly. There were neither eyebrows no eyelashes and no axillary hair. There were no pigmentary changes in the iris; the lens and the fundus of the eye were normal. The skin of the lower eyelid toward the inner canthus was hyperpigmented and strikingly wrinkled. Lacrimation was observed. The bridge of the nose seemed to lack its normal prominence. On closure of the mouth, the thickened lips pouted and gave the patient an

aged appearance. Intraoral examination revealed the absence of teeth, firm mucosa over the jaws, and no alveolar processes. The toenails and fingernails were present and normal. The remainder of the physical examination revealed no abnormalities. After a complete anthropometric examination, the patient was reported to be within the lower limit of normal.

Examination of the head plates taken at 2 years and 10 months, 3 years and 10 months, and 5 years and 4 months, measurements taken from the tracings and their comparison with the normal controls showed the following:

1. Length of the cranium and of the cranial base are equivalent to a small normal.

2. All vertical and horizontal measurements of the face are less than small normal except the length of the lower border of the mandible, which is small normal.

3. All increments of growth show equality with small normal except that of palatal length.

4. Vertical facial proportions are identical with normal proportions, the nasal height yielding 43 per cent of the total facial height.

5. There seems to be little disproportion between cranial and facial growth. The supraorbital region and the nasal bones appear to be normal.

6. The lips are everted, and the tongue occupies the entire oral cavity and flows out between the bony jaws, supporting the lips. This is typical of the infant before the eruption of teeth and of the adult after loss of the teeth.

7. The pattern of growth exhibits all of the phenomena of the normal pattern. The angular relations are close to the mean values of the controls, and, as in the normal person, these relations have a strong tendency to remain stable.

8. The alveolar processes are absent.

Ectodermal dysplasia of the anhidrotic type is due, according to present views, to a gene mutation in the X chromosome, which is sex-linked but not completely recessive. This syndrome is rarely seen in females. From the photographs in the literature a striking similarity of the patients is noted. In complete anodontia due to a gene mutation, an ideal experiment has been created to determine the growth of the jaws in the absence of teeth.

In the light of present-day concepts of the growth of the head, the data do not indicate that the presence or absence of teeth has any direct bearing on general facial development. It should be noted that the cranium and the body of the mandible have attained a small normal size while the middle part of the face is below this level. On the other hand, the rate of growth of all parts shows complete harmony with the normal. Thus this is not a matter of any deceleration of specific areas.

It should be recalled that sites of growth do not all appear simultaneously but rather develop in a definite and orderly sequence. Both embryologic and clinical observations indicate that the cranium is the first part to begin development. Following this comes the first branchial arch, from which is derived the middle part of the face, and then the mandible. Adverse constitutional factors can influence only those areas that are growing at the time of the disturbance but that they are not otherwise selective. On the basis of

this hypothesis one would reason that the etiological factor in the case reported here had operated after the cranium had started to develop and while the middle part of the face was at its earliest and most rapid period of development. Recovery occurred before the mandible could be affected.

There is no doubt about the complete absence of the alveolar process, but this absence has not resulted in a loss of facial height, as might be implied from the sunken appearance of the mouth. Mandibular position is a result of muscle balance, and its position in this boy was no different from what it would have been were all of the teeth present. This is indicated by the fact that the proportions within the facial area were strictly normal.

Systemic disturbances during the developmental period of the fetus or infant may be expressed in the growing tooth. The tooth during its development passes through four stages:

STAGE	DENTAL ABERRATION
1. Growth	
a. Initiation and Proliferation	Anodontia
b. Morphodifferentiation	Peg-shaped tooth; Hutchinson's incisor
c. Apposition	Enamel hypoplasia
2. Calcification	
3. Eruption	Pseudoanodontia
4. Attrition	

A disturbance of any of these stages accurately dates the time that the etiological factor was active. Thus, anodontia represents a lack of initiation of dental development, which usually begins about the fifth week of intrauterine life. During the phase of differentiation the form of the tooth is determined. It is during this period that the peg-shaped tooth in partial anodontia and the Hutchinson incisor in congenital syphilis are formed. These should be carefully distinguished. A disturbance occurring during the time when the enamel-forming cells are active (apposition) is manifested clinically as enamel hypoplasia (chronologic enamel aplasia). Complete and partial anodontia should also be differentiated from pseudoanodontia. In the latter condition the teeth have grown and calcified but have failed to erupt into the oral cavity.

Secondary Carcinoma of the Mandible: By Captain Raymond E. Buirge, *Surgery* **15**: 553-564, April, 1944.

An analysis of seventy-one cases of secondary invasive carcinoma of the mandible (treated at the University of Minnesota Hospitals and the Tumor Clinic, 1924-1943) is reported. This group includes metastases secondary to primary malignancies of the lip, buccal mucosa, lower alveolar process, and the floor of the mouth. Ages ranged from 48 to 84 years; eight were females and sixty-three were males.

The seventy-one cases studied were divided into the following groups:

Stage I. Lesions 1.5 cm. or less in diameter and confined to its local anatomic structure.

Stage II. Lesions over 1.5 cm. in diameter and still limited to local areas.

Stage III. Lesions with local extension but no regional metastases.
Stage IV. Lesions with local extension and regional lymph node metastases confirmed by histologic examination.

Earliest symptoms that caused patients to seek treatment were pain, ulceration, hemorrhage, or metastases. In all of the groups chronic intraoral irritation of some form was considered as an etiological factor. The average delay in diagnosis and treatment in fifty-one patients of this group amounted to 8.4 months. The responsibility for the delay lies jointly with the physician and patient and was often shared by the dental surgeon.

Seventeen patients of the group had a primary lesion on the lower lip. Of these patients, thirteen were subjected to a one-stage partial mandibulectomy which varied in extent from segmental mandibular resection with a suprahyoid neck dissection to a hemi section and disarticulation of the mandible with a supra-omohyoid dissection and sacrifice of large portions of the cheek and lips. Three patients developed Stage III recurrent lesions after one to three years; ten patients developed Stage IV lesions one to five years after initial treatment. Thirteen patients had carcinoma of the buccal mucosa with secondary involvement of the mandible. All of these patients were treated by resection, and/or radiation. Seventeen patients presented themselves with advanced carcinoma of the lower gingiva. Five of these were treated by intensive radiation prior to resection of the jaw. Five cases had primary carcinoma of the floor of the mouth.

Of the entire group of seventy-one patients, fifty-seven were treated by mandibular resection with an operative mortality of 17 per cent. The deaths were due to sepsis, pneumonia and respiratory obstruction. The results obtained in the different groups are presented in tabular form. Preliminary tracheotomy as a routine procedure has improved recent mortality figures.

Of the forty-seven patients surviving operation, 31.9 per cent lived three years; 19.3 per cent lived free of disease five years, and 12.8 per cent lived free of disease for eight years.

Harry A. Salzmann, M.D.

News and Notes

American Society for the Advancement of General Anesthesia in Dentistry

The Fall Meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held on Monday evening, Oct. 23, 1944, at the Hotel McAlpin, 34th Street and Sixth Avenue in New York City. Dr. George F. Seeman of Nashville, Tennessee, newly inducted President, will preside.

The Scientific Session will present a talk by Dr. M. Hillel Feldman of New York City, dealing with everyday problems in the field of general anesthesia for dental surgery.

Dinner will be served at 7:00 P.M. at the Hotel McAlpin, followed by the Scientific Session at 8:30 promptly. The profession is cordially invited.

New York Institute of Clinical Oral Pathology

The New York Institute of Clinical Oral Pathology announces its first open meeting to be held at the New York Academy of Medicine on Monday evening, Oct. 30, 1944, in Hosack Hall.

Outstanding investigators will participate in a symposium on "Fluorine and Dental Caries."

Members of the medical, dental, public health, and other professional groups are cordially invited.

For further information address all communications to the Executive Secretary, 101 East 79th Street, New York 21, N. Y.

New York Society of Orthodontists

The fall meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York City, on Monday and Tuesday, Nov. 13 and 14, 1944.

Orthodontic Society of Peru

A scientific society for the study of orthodontics was founded in Lima, Peru, Jan. 14, 1943. The following officers were elected:

President, Dr. Augusto Taiman
Vice-President, Dr. Ricardo Salazar
Secretary, Dr. Carlos Elbers
Treasurer, Dr. Gerardo Calderon

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*The Journal will make changes or additions to the above list when notified by the secretary-treasurer of the various societies. In the event societies desire more complete publication of the names of officers, this will be done upon receipt of the names from the secretary-treasurer.

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*The Journal will publish the names of the president and secretary-treasurer of foreign orthodontic societies if the information is sent direct to the editor, 8022 Forsythe, St. Louis 5, Mo., U. S. A.

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S. S. White New Orthodontic Appliances

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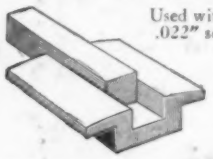
The slot, or channel, for the arch wire is not held to the close manufacturing tolerances found in the Edgewise Arch Bracket.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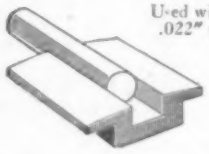
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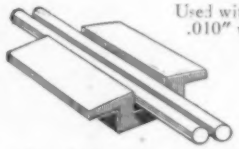
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M 464	.110″ long	$1.40	$13.50	$30.00
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M 467X	(M465 on flat band material ⅛″ x 1¾″ x .004″)	5.50	49.50
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*M 469X	(M465 on flat band material .150″ x 2″ x .004″)	6.50	58.50
*M 492X	(M452†on seamless band No. 171)	7.90	72.00
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M 494X	(M465 on seamless band No. 171)	6.70	60.00
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*M 497X	(M465 on seamless band No. 170)	6.10	56.00

*Available on special order. †M452 is Dr. E. H. Angle Edgewise Arch Bracket.

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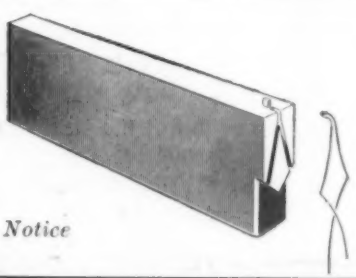
$1.00 each



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